

<<计数组合学导引>>

图书基本信息

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前言

What could be a more basic mathematical activity than counting the number of elements of a finite set? The misleading simplicity that defines the subject of enumerative combinatorics is in fact one of its principal charms. Who would suspect the wealth of ingenuity and of sophisticated techniques that can be brought to bear on a such an apparently superficial endeavor?

Miklós Bóna has done a masterful job of bringing an overview of all of enumerative combinatorics within reach of undergraduates. The two fundamental themes of bijective proofs and generating functions, together with their intimate connections, recur constantly. A wide selection of topics, including several never appearing before in a textbook, are included that give an idea of the vast range of enumerative combinatorics. In particular, for those with sufficient background in undergraduate linear algebra and abstract algebra there are many tantalizing hints of the fruitful connection between enumerative combinatorics and algebra that plays a central role in the subject of algebraic combinatorics. In a fore-word to another book by Miklós Bóna I wrote, "This book can be utilized at a variety of levels, from random samplings of the treasures therein to a comprehensive attempt to master all the material and solve all the exercises. In whatever direction the reader's tastes lead, a thorough enjoyment and appreciation of a beautiful area of combinatorics is certain to ensue." Exactly the same sentiment applies to the present book, as the reader will soon discover.

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内容概要

The book can be used in at least three ways. One can teach a onesemester course from it , choosing the most general topics. One can also use the book for a two-semester course , teaching most of the text and exploring the supplementary material that is given in form of exercises. If one has already taught a one-semester course using a general Combi-natorics textbook and wants to follow up with a second semester that focuses on enumeration , one may use the last six chapters of this book. The book is also useful for teaching an introductory course for graduate students who do not have solid background in Combinatorics. There are several topics here that are discussed in detail in an under-graduate textbook for a first time , such as acyclic and parking functions , unimodality , log-concavity , the real zeros property , and magic squares. Therefore , we hope the book will provide a useful reference material for students interested in these topics.

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章节摘录

插图：Assume we want to send a message from our cell phone using just the two-letter binary alphabet consisting of the letters 0 and 1. Say the message that we want to send is a YES or NO message. We could agree with the recipient that 1 means yes, and 0 means no. This is simple enough if we are both sure that we will not make any mistakes in typing. However, if mistakes are possible, then this way of encoding messages will not be efficient. Indeed, one single mistake could totally turn the meaning of the message into its opposite. One way to make sure that our message is not misunderstood is to send it over and over again, in consecutive bits. Say that we will send our message three times. If the message is YES, then we will send the digits 111, and if the message is NO, then we will send the digits 000. These two codewords are not at all similar to each other. Therefore, if we are sure that at most one typing mistake will be made, we can rest assured that our message will be understood properly. Indeed, if we want to send the codeword 111 (resp. 000), and at most one mistake will be made, then the received word will contain at least two 1s (resp. at least two 0s). So as long as at most one bit is erroneous in each codeword, all errors can be corrected. This simple example can be generalized in many different directions. First, it could be that there are more than just two possible messages to send. Second, it could also be that there are more than two digits in our coding alphabet. Third, more than one mistake may be made during typing. Nevertheless, the main idea of our simple example is crucial. This idea is that if the codewords are sufficiently dissimilar from each other, then we can tell them apart even if a few mistakes are made. It is time that we made the notions of "sufficiently dissimilar" and "few mistakes" more precise.

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媒体关注与评论

Mikl6s B6na has done a masterful job of bringing an overview of all of enumerative combinatorics within reach of undergraduates. The two fundamental themes of bijective proofs and generating functions, together with their intimate connections, recur constantly. A wide selection of topics, including several never appearing before in a textbook, are included that give an idea of the vast range of enumerative combinatorics. In particular, for those with sufficient background in undergraduate linear algebra and abstract algebra there are many tantalizing hints of the fruitful connection between enumerative combinatorics and algebra that plays a central role in the subject of algebraic combinatorics. —Richard Stanley Cambridge, Massachusetts

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