时代教育·国外高校优秀教材精选

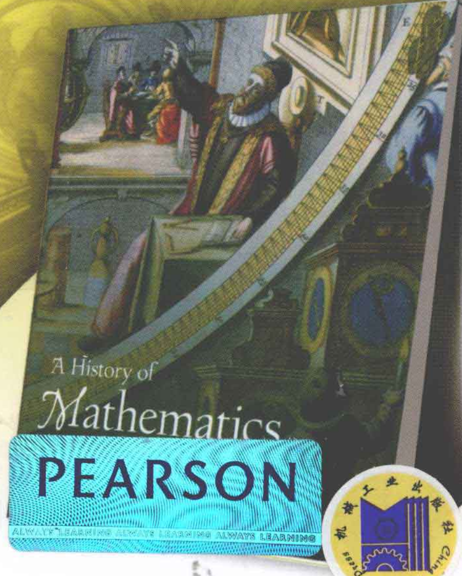
# 数学史

## （英文珍藏版·原书第3版）

# A History of Mathematics

## An Introduction 3rd Edition

(美) Victor J.Katz 著




机械工业出版社
CHINA MACHINE PRESS
PEARSON

时代教育·国外高校优秀教材精选

# 数学史

（英文珍藏版·原书第3版）

# A History of Mathematics

An Introduction

3rd Edition

（美）Victor J. Katz 著

机械工业出版社

本书配有翻译成中文的前言和目录，采用特种纸双色印刷，主要包含小学、中学以及大学所涉及的数学内容的历史。本书将数学史按照年代顺序划分成若干时期，每一时期介绍多个专题。本书的前半部分内容是讲述公元前直到17世纪末微积分发明为止的这一时期的历史，后半部分内容则介绍18世纪至20世纪的数学发展。详细内容可参考中文目录。

本书适合所有对数学的来龙去脉感兴趣的读者。正在学习数学的学生通过本书可以更深入地了解数学的发展过程。教师不仅可以使用本书讲解专门的数学史课程，而且可以在其他和数学相关的课程中使用本书的内容。



**图书在版编目（CIP）数据**

数学史：英文珍藏版：第3版：英文/（美）卡兹（Katz, V. J.）著. —北京：机械工业出版社，2012.4
时代教育·国外高校优秀教材精选
ISBN 978-7-111-38191-4

Ⅰ.①数… Ⅱ.①卡… Ⅲ.①数学史—世界—高等学校—教材—英文 Ⅳ.①O11

中国版本图书馆CIP数据核字（2012）第081982号

机械工业出版社（北京市百万庄大街22号 邮政编码100037）
策划编辑：韩效杰 责任编辑：韩效杰
封面设计：鞠 扬 责任印制：乔 宇
三河市宏达印刷有限公司印刷
2012年6月第1版第1次印刷
200mm×232mm·63印张·2插页·1562千字
标准书号：ISBN 978-7-111-38191-4
定价：139.00元

凡购本书，如有缺页、倒页、脱页，由本社发行部调换

| 电话服务 | 网络服务 |
| --- | --- |
| 社服务中心：（010）88361066 | 门户网：http://www.cmpbook.com |
| 销售一部：（010）68326294 | |
| 销售二部：（010）88379649 | 教材网：http://www.cmpedu.com |
| 读者购书热线：（010）88379203 | **封面无防伪标均为盗版** |

# 序　　言

美国数学协会（MAA）下属教师数学教育委员会在其《呼唤变革：关于数学教师的数学修养的建议书》中，提议所有未来中小学数学教师

注意培养自身对各种文化在数学思想的成长与发展过程中所作的贡献有一定的鉴赏能力，对来自各种不同文化的个人（无论男女）在古代、近代和现代数学论题的发展上所作的贡献有所研究，并对中小学数学中主要概念的历史发展有所认识．

根据 MAA 的观点，数学史方面的知识能向学生表明，数学是一项非常重要的人类活动．数学不是一产生就有像我们教科书中那样完美的形式，它常常是出于解决问题的需要，以一种直观的和实验性的形式发展出来的．数学思想的实际发展历程能有效地被用来激励和启迪今天的学生．

这本新的数学史教科书是基于这样一种认识产生的，就是：不仅未来的中小数学教师，即便是未来的大学数学教师，为了更有效地给他们的学生教好数学课，都需要对历史背景有所了解．因此，这本书是为那些主修数学，今后打算在大学或高中任教的低年级或高年级的学生设计的，内容集中于中小学或大学本科教学计划中通常包含的那些数学课程的历史．因为一门数学课程的历史会为讲解这一课程提供非常好的思路，为了使未来的数学教师能在历史的基础上开展课堂教学，我们会对每一个新概念作充分细致的解说．实际上，许多习题就是要求读者去讲一堂课．我希望这些学生以及未来的教师能从本书获得一种关于数学的来龙去脉的知识，一种对数学中许多重要的概念有更深入的理解的知识．

## 本书主要特色

### 材料组织灵活

尽管本书主要是按年代顺序划分成若干时期来进行组织的，但在每一时期内则是按专题来进行组织的．通过查阅详尽的细节标题，读者可以选择某一特定的专题，对其历史的全程进行跟踪．例如，想研究方程求解时，就可以研究古代埃及人和巴比伦人的方法，希腊人的几何解法，中国人的数值解法，伊斯兰人用圆锥截线求解三次方程的方法，意大利人所发现的求解三次方程和四次方程的一套算法，拉格朗日为解高次多项式方程而研究出来的一套判据，高斯在求解割圆方程方面所作的工作，以及伽罗瓦用置换来讨论求解方程的工作，这一工作我们今天称之为伽罗瓦理论．

### 关注教科书

从事数学研究，发现新的定理和技巧是一回事，以一种使其他人也能掌握的方式来阐述这些定理和技巧则是另一回事．因此，在大部分章中都会讨论一种或几种那个时代的重要的教科书．学生们能

够通过这些著作来学习那些伟大的数学家们的思想．今天的学生将能够看到某些论题在过去是怎样被处理的，并能将这些处理方法与当今教科书中的方法加以比较，而且还能看到许多年前的学生想要解决的是什么样的问题．

**数学的应用**

有两章是完全用来讲数学方法的，也就是讲数学是怎样用于解决人类其他活动领域内的问题的．这两章，一章是关于希腊时期的，另一章则涉及文艺复兴时期，它们相当大的部分是讲述天文学的．事实上，在古代，数学家常常也是天文学家．要想了解希腊数学的主要内容，关键是要了解希腊人关于天体的模型，以及怎样借助这个模型用数学来得出预言．类似地，我们讨论了哥白尼-开普勒的天体模型以及文艺复兴时期的数学家们是怎样用数学来研究它的．我们还将考察在这两个时期数学在地理学中的应用．

**非西方数学**

我们还下了特别的功夫来讨论数学在世界上除欧洲以外一些地区的发展．于是，有相当多的材料是有关中国、印度和伊斯兰世界的数学的．此外，第 11 章讨论了在世界各地各种其他社会中的数学．读者会看到，有些数学概念在很多地方出现过，尽管也许并不是在我们西方称之为“数学”的背景中出现．

**按专题分类的习题**

每一章均含有许多习题，为了便于选取，这些习题都是按专题分类汇集的．有些习题只需要简单的计算，有些则需要填补正文中数学论证的空白．讨论题是一种无明确答案的开放式问题，其中有些可能要作些研究才能回答．很多这类问题要求学生动脑筋去思考怎样利用在课堂上学到的历史材料．有许多习题即使读者不打算做，也至少应该阅读一下，以便对该章的内容有更全面的了解．（奇数序号计算题和部分奇数序号证明题的答案可在书末的答案节中找到．）

**焦点论坛**

**小传**　为了便于参阅，对许多我们谈到过他们工作的数学家，其小传被放在独立于正文的栏框中．特别是，尽管由于种种原因参与到数学研究中来的妇女为数不多，我们还是写了几位重要的女数学家的小传．妇女通常都是在克服了重重困难后才能成功地对数学事业作出贡献．

**专题**　还有一些特殊论题以加框文字的专题形式散见于全书．其中有这样一些专题，如埃及人对希腊数学影响问题的讨论，托勒密著作中函数概念的讨论，各种连续概念的比较，还有一些专题，它们把重要的定义汇集在一起以便于查阅参考．

**补充教学资料**

每一章的开始有一段相关引语和对一桩重要数学“事件”的描述．每章还有一份附加了注释的参考文献，学生们从这些文献中可以获得更多的信息．考虑到本书的读者主要是那些未来的中学或大专院校数学教师，我在书末加了一个附录，对如何在数学教学中使用本书提供了一些建议．附录包括：一张中学和大专院校数学课程中各专题的历史与本书相应章节的明细对照列表；关于如何组织这类材料以适合课堂教学的一些建议；一张详细的大事年表，以帮助读者了解数学发现与世界史上发生的其他事件的联系．封底内有一张本书中出现的大多数数学家的编年名录．最后，考虑到学生们在称呼数

学家的名字时可能遇到的发音困难，书末的人名索引特别附加了发音提示．

**预备知识**

学过一年微积分，具备了可资运用的知识，就足以理解本书的前 16 章，以后的几章要求更多一些数学上的准备，但是各节的标题就清楚地表明了需要哪些数学知识．例如，要想充分理解第 19 章和第 21 章，就要求学生学过抽象代数．

## 课程内容的弹性

本书包括的内容远远超过了普通一学期的数学史的课程．实际上，它的内容适合一学年的课程．前半部分内容是讲述公元前直到 17 世纪末微积分发明为止的这一时期的．后半部分内容则是讲 18 世纪至 20 世纪数学的．然而对于那些只有一个学期学时的教师来说，有几种使用本书的方式：第一种方式可以选前 12 章中的绝大部分内容，然后就以微积分作结束；第二种方式是选讲一到两个专题的全部历史．以下是可供选择的专题：方程求解，微积分思想，几何学概念，三角学及其在天文和测量方面的应用，组合学、概率论和统计学，近世代数和数论．（附录中的列表将帮助读者找到与所选专题相应的章节）．对于专题选讲，我建议要尽量包括 20 世纪的内容，以使读者认识到数学是在不断创新和发展的．最后，可以将前两种方式结合起来，即按年代顺序讲授古代数学的内容，然后再选讲某个近现代数学的专题．

## 本版更新之处

本书前两版获得了广泛的接受，这鼓励我保持它的基本体系和内容．然而，我仍力图在本书的内容及表述的清晰性两方面作出一系列的改进．改进的根据是许多使用本书第一、二版的人所提出的意见，以及在新近文献中所刊载的有关数学史中的一些新发现．为使本书使用更方便起见，我将某些内容改组使其独立成章．实际上每一小节都有一些小小的改动，而自第二版以来较重大的改动则有：通过分析《论方法》羊皮书而发现的关于阿基米德的新材料；关于托勒密《地理学》的新增一节；更多关于中国、印度和伊斯兰数学的介绍，这些介绍是以我的新作《数学原著选》中涉及这几种文明的数学原始资料为基础的；关于埃及和巴比伦数学也有新增的内容；关于 19、20 世纪统计学的新材料；关于 18 世纪将牛顿《原理》中的某些结果翻译成微分学语言的说明．全书以关于克莱第一问题——庞加莱猜想解决的简短介绍为结束．我力求改正老版本中史实上的全部错误，并杜绝新的错误，但对任何人指出本书还余留的错误，我将深表感谢．每章还增加了一些新的问题，其中有些比较简单．参考文献方面也尽可能作了更新．还增加了一些新的邮票作为插图．不过应当注意到，任何这种试图表现 16 世纪前数学家的邮票上的画像——别处的画像实际上也一样——都是想像的．至今还没有哪一张这类人物的画像是有可靠证据的．

## 致谢

和任何一本书一样，要不是有许多人的帮助，本书是不可能写成的．下面各位曾应我的请求阅读了本书大部分章节并提出了宝贵的建议：Mancia Asher（Ithaca 学院），J. Lennart Berggren（Simon Fraser 大学)，Robert Kreiser（美国大学教授联合会)，Robert Rosenfeld（Nassau 社区大学)，John Milcetich（哥伦比亚特区大学)，Eleanor Robson（剑桥大学）和 Kim Plofker（布朗大学）. 此外，很多人对本书的第二版和第三版提供了详尽的建议，尽管我没有全部采纳，但我真诚地感谢他们为改进本书所提出的想法，这些人中有 Ivor Grattan Guinness，Richard Askey，William Anglin，Claudia Zaslavsky，Rebekka Struik，William Ramaley，Joseph Albree，Calvin Jongsma，David Fowler，John Stillwell，Christian Thybo，Jim Tattersall，Judith Grabiner，Tony Gardiner，Ubi D'Ambrosio，Dirk Struik 和 David Rowe. 我衷心地感谢所有这些人.

对书稿审阅的很多人也以他们细致深入的评论给了我很大的帮助，使本书增色不少，没有他们的帮助本书就不会是现在这个样子. 第一版的审稿人有：Duane Blumberg（西南路易斯安那大学)，Walter Czarnec（Framington 州立大学)，Joseph Dauben（Lehman 学院-CUNY)，Harvey Davis（密执安州立大学)，Joy Easton（西弗吉尼亚大学)，Carl FitzGerald（加利福尼亚州大学圣地亚哥分校)，Basil Gordon（加利福尼亚州大学洛杉矶分校)，Mary Gray（美国大学)，Branko Grunbaum（华盛顿大学)，William Hintzman（圣地亚哥州立大学)，Barnabas Hughes（加利福尼亚州州立大学-Northridge)，Israel Kleiner（约克大学)，David E. Kullmam（迈阿密大学)，Robert L. Hall（威斯康星大学，Milwaukee 分校)，Richard Marshall（东密执安大学)，Jerold Mathews（艾奥瓦州立大学)，Willard Parker（堪萨斯州立大学)，Clinton M. Petty（Missouri 大学，Columbia)，Howard Prouse（Mankato 州立大学)，Helmut Rohrl（加利福尼亚州大学圣地亚哥分校)，David Wilson（佛罗里达大学)，以及 Frederick Wright（北卡罗来纳大学 Chapel Hill 分校).

第二版的审稿人有：Salvatore Anastasio（纽约州立大学，New Platz 分校)，Bruce Crauder（俄克拉何马州立大学)，Walter Czarnec（Framingham 州立学院)，William England（密西西比州立大学)，David Jabon（东华盛顿大学)，Charles Jones（Ball 州立大学)，Michael Lacey（印地安那大学)，Harold Martin（北密执安大学)，James Murdock（艾奥瓦州立大学)，Ken Shaw（佛罗里达州立大学)，Svere Smalo（加利福尼亚州大学，Santa Barbara 分校)，Domina Eberle Spencer（Connecticut 大学)，Jimmy Woods（North Georgia College).

第三版的审稿人有：Edward Boamah（Blackburn 学院)，Douglas Cashing（St. Bonaventure 大学)；Morley Davidson（Kent 大学)；Martin J. Erickson（Turman 大学)；Jian-Guo Liu（Maryland 大学)；Warren William McGovern（Bowling Green 州立大学)；Daniel E. Otero（Xavier 大学)；Talmage James Reid（密西西比大学)；Angelo Segalla（加利福尼亚州大学，长滩)；Lawrence Shirley（Towson 大学)；Agnes Tuska（加利福尼亚州大学 Fresno 分校)；Jeffrey X. Watt（印地安纳州大学-普渡大学 Indianapolis 分校).

我还在各种论坛上（包括美国数学协会和美国数学会联合举办的历次年会的数学史分组会）与许多数学史学家们交谈过，从中获益匪浅. 这些在不同时期帮助过我（而我在前面未能提及）的人有：V. Frederick Rickey（美国军事科学院)，Florence Fasanelli（美国科学发展协会)，Israel Kleiner（约克大学)，Abe Shenitzer（约克大学)，Frank Swetz（Pennsylvania 州立大学)，以及 Janet Beery（Redlands 大学). 同时我要感谢兰利学校的 Karen Dee Michalowicz，他向我介绍了如何与在职的和未来的高中教

师交流，他在2006年的意外离世真是一个悲剧．此外我还从数学史及其在教学中的应用研究所各种会议和2007年亚洲数学PREP研讨会的参加者那里学到了不少东西．我在哥伦比亚特区大学数学史（及其他）班上的学生在澄清我的诸多看法上也给了我不少帮助．自然，我欢迎任何地方的学生和同事为进一步改进本书而提出的任何意见和来信．

感谢 Harper Collins 出版社的前编辑 Steve Quigley，Don Gecewicz 和 George Duda，他们帮助我完成了本书的第一版，感谢第二版的编辑 Jennifer Albanese. 我还应特别感谢本书的新编辑 Bill Hoffman，无论是在本书第三版还是在缩减本的编辑出版过程中，他都提出了许多建议和给予了大力支持．Pearson Addison-Wesley 出版社的 Elizabeth Bernadi 为确保本书如期出版付出了很大辛劳，Jean-Marie Magnier 帮助发现了习题答案中的一些错误．生产管理员 Paul C. Anagnostopoulos，Jennifer McClain，Laurel Muller，Yonie Overton 和 Joe Snowden 等也出色地完成了他们的任务，使本书能够顺利面世．我谨向以上各位表示感谢．

最后我要感谢我的妻子菲丽丝，为了她多年来给我的全部的爱和支持，无论是在我为本书工作的时刻，还是其他的时光．

V. J. 卡兹
Silver Spring，MD
2008 年 5 月

# Preface

In *A Call For Change: Recommendations for the Mathematical Preparation of Teachers of Mathematics*, the Mathematical Association of America's (MAA) Committee on the Mathematical Education of Teachers recommends that all prospective teachers of mathematics in schools

> . . . develop an appreciation of the contributions made by various cultures to the growth and development of mathematical ideas; investigate the contributions made by individuals, both female and male, and from a variety of cultures, in the development of ancient, modern, and current mathematical topics; [and] gain an understanding of the historical development of major school mathematics concepts.

According to the MAA, knowledge of the history of mathematics shows students that mathematics is an important human endeavor. Mathematics was not discovered in the polished form of our textbooks, but was often developed in an intuitive and experimental fashion in order to solve problems. The actual development of mathematical ideas can be effectively used in exciting and motivating students today.

This textbook grew out of the conviction that both prospective school teachers of mathematics and prospective college teachers of mathematics need a background in history to teach the subject more effectively. It is therefore designed for junior or senior mathematics majors who intend to teach in college or high school, and it concentrates on the history of those topics typically covered in an undergraduate curriculum or in elementary or high school. Because the history of any given mathematical topic often provides excellent ideas for teaching the topic, there is sufficient detail in each explanation of a new concept for the future (or present) teacher of mathematics to develop a classroom lesson or series of lessons based on history. In fact, many of the problems ask readers to develop a particular lesson. My hope is that students and prospective teachers will gain from this book a knowledge of how we got here from there, a knowledge that will provide a deeper understanding of many of the important concepts of mathematics.

## Distinguishing Features

### FLEXIBLE ORGANIZATION

Although the text's chief organization is by chronological period, the material is organized topically within each period. By consulting the detailed subsection headings, the reader can choose to follow a particular theme throughout history. For example, to study equation solving one could consider ancient Egyptian and Babylonian methods, the geometrical solution methods of the Greeks, the numerical methods of the Chinese, the Islamic solution methods for cubic equations by use of conic sections, the Italian discovery of an algorithmic solution of cubic and quartic equations, the work of Lagrange in developing criteria for methods of solution of higher degree polynomial equations, the work of Gauss in solving cyclotomic equations, and the work of Galois in using permutations to formulate what is today called Galois theory.

## FOCUS ON TEXTBOOKS

It is one thing to do mathematical research and discover new theorems and techniques. It is quite another to elucidate these in such a way that others can learn them. Thus, in many chapters there is a discussion of one or more important texts of the time. These are the works from which students learned the important ideas of the great mathematicians. Today's students will see how certain topics were treated and will be able to compare these treatments to those in current texts and see the kinds of problems students of years ago were expected to solve.

## APPLICATIONS OF MATHEMATICS

Two chapters, one for the Greek period and one for the Renaissance, are devoted entirely to mathematical methods, the ways in which mathematics was used to solve problems in other areas of study. A major part of both chapters deals with astronomy since in ancient times astronomers and mathematicians were usually the same people. To understand a substantial part of Greek mathematics, it is crucial also to understand the Greek model of the heavens and how mathematics was used in applying this model to give predictions. Similarly, I discuss the Copernicus-Kepler model of the heavens and consider how mathematicians of the Renaissance applied mathematics to its study. I also look at the applications of mathematics to geography during these two time periods.

## NON-WESTERN MATHEMATICS

A special effort has been made to consider mathematics developed in parts of the world other than Europe. Thus, there is substantial material on mathematics in China, India, and the Islamic world. In addition, Chapter 11 discusses the mathematics of various other societies around the world. Readers will see how certain mathematical ideas have occurred in many places, although not perhaps in the context of what we in the West call "mathematics."

## TOPICAL EXERCISES

Each chapter contains many exercises, organized in order of the chapter's topics. Some exercises are simple computational ones, while others help to fill gaps in the mathematical arguments presented in the text. **For Discussion** exercises are open-ended questions, which may involve some research to find answers. Many of these ask students to think about how they would use historical material in the classroom. Even if readers do not attempt many of the exercises, they should at least read them to gain a fuller understanding of the material of the chapter. (Answers to the odd numbered computational problems as well as some odd numbered "proof" problems are included at the end of the book.)

## FOCUS ESSAYS

**Biographies** For easy reference, many biographies of the mathematicians whose work is discussed are in separate boxes. Although women have for various reasons not participated in large numbers in mathematical research, biographies of several important women mathematicians are included, women who succeeded, usually against heavy odds, in contributing to the mathematical enterprise.

**Special Topics** Sidebars on special topics also appear throughout the book. These include such items as a treatment of the question of the Egyptian influence on Greek mathematics, a discussion of the idea of a function in the work of Ptolemy, a comparison of various notions of continuity, and several containing important definitions collected together for easy reference.

### ADDITIONAL PEDAGOGY

At the start of each chapter is a relevant quotation and a description of an important mathematical "event." Each chapter also contains an annotated list of references to both primary and secondary sources from which students can obtain more information. Given that a major audience for this text is prospective teachers of secondary or college-level mathematics, I have provided an appendix giving suggestions for using the text material in teaching mathematics. It contains a detailed list to correlate the history of various topics in the secondary and college curriculum to sections in the text; there are suggestions for organizing some of this material for classroom use; and there is a detailed time line that helps to relate the mathematical discoveries to other events happening in the world. On the back inside cover there is a chronological listing of most of the mathematicians discussed in the book. Finally, given that students may have difficulty pronouncing the names of some mathematicians, the index has a special feature: a phonetic pronunciation guide.

## PREREQUISITES

A knowledge of calculus is sufficient to understand the first 16 chapters of the text. The mathematical prerequisites for later chapters are somewhat more demanding, but the various section titles indicate clearly what kind of mathematical knowledge is required. For example, a full understanding of chapters 19 and 21 will require that students have studied abstract algebra.

## COURSE FLEXIBILITY

The text contains more material than can be included in a typical one-semester course in the history of mathematics. In fact, it includes adequate material for a full year course, the first half being devoted to the period through the invention of calculus in the late seventeenth century and the second half covering the mathematics of the eighteenth, nineteenth, and twentieth centuries. However, for those instructors who have only one semester, there are several ways to use this book. First, one could cover most of the first twelve chapters and simply conclude with calculus. Second, one could choose to follow one or two particular themes through history. (The table in the appendix will direct one to the appropriate sections to include when dealing with a particular theme.) Among the themes that could be followed are equation solving; ideas of calculus; concepts of geometry; trigonometry and its applications to astronomy and surveying; combinatorics, probability, and statistics; and modern algebra and number theory. For a thematic approach, I would suggest making every effort to include material on mathematics in the twentieth century, to help students realize that new mathematics is continually being discovered. Finally, one could combine the two approaches and cover ancient times chronologically, and then pick a theme for the modern era.

## NEW FOR THIS EDITION

The generally friendly reception of this text's first two editions encouraged me to maintain the basic organization and content. Nevertheless, I have attempted to make a number of improvements, both in clarity and in content, based on comments from many users of those editions as well as new discoveries in the history of mathematics that have appeared in the recent literature. To make the book somewhat easier to use, I have reorganized some material into shorter chapters. There are minor changes in virtually every section, but the major changes from the second edition include: new material about Archimedes discovered in analyzing the palimpsest of the *Method;* a new section on Ptolemy's *Geography;* more material in the Chinese, Indian, and Islamic chapters based on my work on the new *Sourcebook* dealing with the mathematics of these civilizations, as well as the ancient Egyptian and Babylonian ones; new material on statistics in the nineteenth and twentieth centuries; and a description of the eighteenth-century translation into the differential calculus of some of Newton's work in the *Principia*. The text concludes with a brief description of the solution to the first Clay Institute problem, the Poincarè conjecture. I have attempted to correct all factual errors from the earlier editions without introducing new ones, yet would appreciate notes from anyone who discovers any remaining errors. New problems appear in every chapter, some of them easier ones, and references to the literature have been updated wherever possible. Also, a few new stamps were added as illustrations. One should note, however, that any portraits on these stamps—or indeed elsewhere—purporting to represent mathematicians before the sixteenth century are fictitious. There are no known representations of any of these people that have credible evidence of being authentic.

## ACKNOWLEDGMENTS

Like any book, this one could not have been written without the help of many people. The following people have read large sections of the book at my request and have offered many valuable suggestions: Marcia Ascher (Ithaca College); J. Lennart Berggren (Simon Fraser University); Robert Kreiser (A.A.U.P.); Robert Rosenfeld (Nassau Community College); John Milcetich (University of the District of Columbia); Eleanor Robson (Cambridge University); and Kim Plofker (Brown University). In addition, many people made detailed suggestions for the second and third editions. Although I have not followed every suggestion, I sincerely appreciate the thought they gave toward improving the book. These people include Ivor Grattan-Guinness, Richard Askey, William Anglin, Clàudia Zaslavsky, Rebekka Struik, William Ramaley, Joseph Albree, Calvin Jongsma, David Fowler, John Stillwell, Christian Thybo, Jim Tattersall, Judith Grabiner, Tony Gardiner, Ubi D'Ambrosio, Dirk Struik, and David Rowe. My heartfelt thanks to all of them.

The many reviewers of sections of the manuscript for each of the editions have also provided great help with their detailed critiques and have made this a much better book than it otherwise could have been. For the first edition, they were Duane Blumberg (University of Southwestern Louisiana); Walter Czarnec (Framington State University); Joseph Dauben (Lehman College–CUNY); Harvey Davis (Michigan State University); Joy Easton (West Virginia University); Carl FitzGerald (University of California, San Diego); Basil Gordon (University of California, Los Angeles); Mary Gray (American University); Branko Grun-

baum (University of Washington); William Hintzman (San Diego State University); Barnabas Hughes (California State University, Northridge); Israel Kleiner (York University); David E. Kullman (Miami University); Robert L. Hall (University of Wisconsin, Milwaukee); Richard Marshall (Eastern Michigan University); Jerold Mathews (Iowa State University); Willard Parker (Kansas State University); Clinton M. Petty (University of Missouri, Columbia); Howard Prouse (Mankato State University); Helmut Rohrl (University of California, San Diego); David Wilson (University of Florida); and Frederick Wright (University of North Carolina at Chapel Hill).

For the second edition, the reviewers were Salvatore Anastasio (State University of New York, New Paltz); Bruce Crauder (Oklahoma State University); Walter Czarnec (Framingham State College); William England (Mississippi State University); David Jabon (Eastern Washington University); Charles Jones (Ball State University); Michael Lacey (Indiana University); Harold Martin (Northern Michigan University); James Murdock (Iowa State University); Ken Shaw (Florida State University); Svere Smalo (University of California, Santa Barbara); Domina Eberle Spencer (University of Connecticut); and Jimmy Woods (North Georgia College).

For the third edition, the reviewers were Edward Boamah (Blackburn College); Douglas Cashing (St. Bonaventure University); Morley Davidson (Kent State University); Martin J. Erickson (Truman State University); Jian-Guo Liu (University of Maryland); Warren William McGovern (Bowling Green State University); Daniel E. Otero (Xavier University); Talmage James Reid (University of Mississippi); Angelo Segalla (California State University, Long Beach); Lawrence Shirley (Towson University); Agnes Tuska (California State University at Fresno); Jeffrey X. Watt (Indiana University–Purdue University Indianapolis).

I have also benefited greatly from conversations with many historians of mathematics at various forums, including numerous history sessions at the annual joint meetings of the Mathematical Association of America and the American Mathematical Society. Among those who have helped at various stages (and who have not been mentioned earlier) are V. Frederick Rickey, United States Military Academy; Florence Fasanelli, AAAS; Israel Kleiner, York University; Abe Shenitzer, York University; Frank Swetz, Pennsylvania State University, and Janet Beery, University of Redlands. In addition, I want to thank Karen Dee Michalowicz, of the Langley School, who showed me how to reach current and prospective high school teachers, and whose untimely death in 2006 was such a tragedy. In addition, I learned a lot from all the people who attended various sessions of the Institute in the History of Mathematics and Its Use in Teaching, as well as members of the 2007 PREP workshop on Asian mathematics. My students in History of Mathematics classes (and others) at the University of the District of Columbia have also helped me clarify many of my ideas. Naturally, I welcome any additional comments and correspondence from students and colleagues elsewhere in an effort to continue to improve this book.

My former editors at Harper Collins, Steve Quigley, Don Gecewicz, and George Duda, who helped form the first edition, and Jennifer Albanese, who was the editor for the second edition, were very helpful. And I want to particularly thank my new editor, Bill Hoffman, for all his suggestions and his support during the creation of both the brief edition and this new third edition. Elizabeth Bernardi at Pearson Addison-Wesley has worked hard to keep me on deadline, and Jean-Marie Magnier has caught several errors in the answers to problems,

for which I thank her. The production staff of Paul C. Anagnostopoulos, Jennifer McClain, Laurel Muller, Yonie Overton, and Joe Snowden have cheerfully and efficiently handled their tasks to make this book a reality.

Lastly, I want to thank my wife Phyllis for all her love and support over the years, during the very many hours of working on this book and, of course, during the other hours as well.

Victor J. Katz
Silver Spring, MD
May 2008

# 目　录

## 第二篇　中世纪数学