

# Preface

The opening paragraph in the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics* states that its recommendations are grounded in the belief that all students should be taught in a way that fosters conceptual understanding of mathematical concepts and skills. This same belief has guided and influenced each edition of *Mathematics for Elementary Teachers: A Conceptual Approach*, which continues to emphasize the use of models and processes for providing insights into mathematical concepts.

## PREPARING SUCCESSFUL TEACHERS

The primary objectives of this textbook are to provide (1) a conceptual understanding of mathematics, (2) a broad knowledge of basic mathematical skills, and (3) ideas and methods that generate enthusiasm for learning and teaching mathematics. Our approach to educating prospective teachers has been guided and influenced throughout by adherence to the standards set by the National Council of Teachers of Mathematics (NCTM) and by a special emphasis on problem solving and active student participation.

We have benefited from years of experience in the classroom and from the numerous workshops we have presented to teachers of elementary- and middle-school children. Our experiences have shown us that prospective teachers who engage with mathematics conceptually have a better chance of acquiring knowledge, solving problems, and gaining confidence in their ability to reason. We designed this text to effectively foster these crucial conceptualizing and problem-solving skills in prospective teachers.

Each section of the text begins with an engaging, interactive Math Activity and a Problem Opener. Both of these features involve problem solving and provide excellent opportunities for class discussions. We then proceed to develop the mathematical concepts of the section using models and diagrams before presenting students with abstractions. We also analyze a Problem-Solving Application within the section using Polya's four-step process. These applications serve to deepen and extend students' understanding of the content. In the exercise sets, we offer several categories of questions that are designed not only to reinforce critical knowledge, but also to strengthen students' reasoning and problem-solving skills.

In this edition, we have added Writing and Discussion questions that enable students to practice their communication skills and Making Connections questions that ask them to explain the connections between the special features and the topics in each section and NCTM's Standards and Expectations. Many of these questions are posed within a classroom context to help undergraduates become better prepared for their teaching careers.

We believe that our approach gives future teachers a conceptual understanding of mathematics and a solid foundation of problem-solving and communication skills that they will be able to impart to their students.

## SUGGESTIONS FOR ACTIVE STUDENT PARTICIPATION

NCTM's *Principles and Standards for School Mathematics* recommends that students develop their mathematical understanding by looking for patterns, making conjectures, and verifying hypotheses. Many instructors have been influenced by these recommendations and are using instructional methods that involve more active student participation and less

lecture time. Here are a few suggestions for utilizing the special features of the text that encourage active student participation.

### Math Activities

The one-page Math Activities preceding each section of the text are augmented by the Manipulative Kit, a set of perforated color cardstock materials that can be packaged with the text for a nominal fee, upon request. These activities are designed to accomplish two major objectives: to develop students' conceptual understanding before they are given rules, definitions, and procedures; and to familiarize them with materials that are common in elementary schools and activities that can be adapted to the elementary-school curriculum.

### Virtual Manipulatives

Some instructors find that there is not sufficient time or a suitable classroom setting for carrying out the one-page Math Activities. One solution is to use the Virtual Manipulatives on the companion website ([www.mhhe.com/bennett-nelson](http://www.mhhe.com/bennett-nelson)), now in an easily accessible Flash-based interface. There is a Virtual Manipulative complement for the items in the physical manipulative kit, and each item in the virtual set has a toolbar, a work area, a "note pad" in which to type results, and a menu of the related Math Activities from the text.

### Problem Openers

These features open each section of the text with a problem statement related to the content of that section. Problem Openers can be used in a variety of ways, such as to prompt class discussions, to facilitate group work and problem solving, and to motivate interest in new topics. The solution to each Problem Opener and the problem-solving strategies required are contained in the *Instructor's Resource Manual*. The manual also offers one or more ideas for looking back and extending each Problem Opener for additional problem-solving practice in class or on assignments and tests.

### Problem-Solving Applications

Each section of the text contains at least one Problem-Solving Application that is related to the section content and is analyzed using Polya's four-step strategy (introduced in Chapter 1). These problems can be posed to the class for small-group problem-solving activities. A suggested follow-up discussion might involve comparing students' plans for solving a particular problem and their solutions with those suggested in the text.

### Technology and Laboratory Connections

Each section of the text has a Technology or Laboratory Connection featuring an in-depth investigation designed to enhance the mathematical content of the section. These investigations pose open-ended questions that require collecting data, looking for patterns, and forming and verifying conjectures. Many of the Connections integrate the use of computers or calculators.

### Interactive Math Applets

Eleven applets, available on the companion website, are designed to involve students in interactive explorations of some of the key concepts from each chapter.