CONCEPTS AND
APPLICATIONS:
A COMBINED
APPROACH

ELEMENTARY
AND
INTERMEDIATE
Algebra
SECOND EDITION

Bittinger

Ellenbogen

Johnson

ELEMENTARY
AND
INTERMEDIATE
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CONCEPTS AND APPLICATIONS:
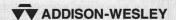## A COMBINED APPROACH

Marvin L. Bittinger
Indiana University–Purdue University at Indianapolis

David J. Ellenbogen
Community College of Vermont

Barbara L. Johnson
Indiana University–Purdue University at Indianapolis

SECOND EDITION

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Preface

Appropriate for a course combining the study of elementary and intermediate algebra, this text covers both elementary and intermediate algebra topics without the repetition of instruction necessary in two separate texts. It is the third of three texts in an algebra series that also includes *Elementary Algebra*: *Concepts and Applications*, Fifth Edition, by Bittinger/Ellenbogen and *Intermediate Algebra*: *Concepts and Applications*, Fifth Edition, by Bittinger/Ellenbogen. *Elementary and Intermediate Algebra Concepts and Applications*: *A Combined Approach*, Second Edition, is a significant revision of the First Edition with respect to design, contents, pedagogy, and an expanded supplements package. This series is designed to prepare students for any mathematics course at the college algebra level.

Approach

Our approach is designed to help today's students both learn and retain mathematical concepts. The goal of this revision was to address the major challenges for teachers of developmental mathematics courses that we have seen emerging during the 1990s. The first challenge is to prepare students of developmental mathematics for the transition from "skills-oriented" elementary and intermediate algebra courses to more "concept-oriented" college-level mathematics courses. The second is to teach these same students critical thinking skills: to reason mathematically, to communicate mathematically, and to solve mathematical problems. The third challenge is to reduce the amount of content overlap between elementary algebra and intermediate algebra texts.

Following are some aspects of the approach that we have used in this revision to help meet the challenges we all face teaching developmental mathematics.

Problem Solving

One distinguishing feature of our approach is our treatment of and emphasis on problem solving. We use problem solving and applications to motivate the material wherever possible, and we include real-life applications and problem-solving techniques throughout the text. Problem solving not only encourages

students to think about how mathematics can be used, it helps to prepare them for more advanced material in later courses.

- In Chapter 2, we introduce the five-step process for solving problems: (1) Familiarize, (2) Translate, (3) Carry out, (4) Check, and (5) State the answer. These steps are introduced in Chapter 2 and used consistently throughout the text whenever we encounter a problem-solving situation. Repeated use of this problem-solving strategy gives students a sense that they have a starting point for any type of problem they encounter, and frees them to focus on the mathematics necessary to successfully translate the problem situation. In this edition (see pages 92 and 351), estimation has been used more consistently to help with the Familiarize and Check steps.

Functions and Graphing

To retain skills and to apply them at a more conceptual level in later courses, students must have an intuitive understanding of the material. A visual interpretation of mathematical concepts can provide this type of understanding to those students with a visual, rather than symbolic, orientation.

- Chapter 3 contains an intuitive introduction to graphing, a topic that is integrated throughout the text. This helps students to visualize the mathematics of many concepts while allowing them to develop facility with graphing.
- We introduce functions in Chapter 7. Functions then appear throughout the remainder of the text to enrich the coverage of other topics and to increase students' familiarity with this important topic.
- We have more than doubled the number of Technology Connections in the Second Edition. This optional feature allows students to use a graphing calculator or computer to help visualize concepts, and provides additional opportunities for students to see the usefulness of functions and graphing. (See pages 135, 148, and 292.)

Applications

Interesting applications of mathematics help motivate both students and instructors. Solving applied problems gives students the opportunity to see their conceptual understanding put to use in a real way. In the Second Edition of *Elementary and Intermediate Algebra Concepts and Applications: A Combined Approach*, not only have we increased the number of applications by more than 60 percent, but we have also included a wide variety of real-data applications throughout the text. Over 80 percent of our applications are new. Art has also been integrated into the applications and exercises to aid the student in visualizing the mathematics. (See pages 121, 355, and 357.)

Content (see also Content changes on p. xvi)

- Chapter 1 includes a brief review of arithmetic topics and then moves quickly into elementary algebra topics. This allows instructors sufficient time to cover the topics necessary to prepare students for intermediate algebra.

▪ This edition includes a valuable review appendix for those students who require a brief overview of elementary algebra topics before moving on to the intermediate algebra portion of the text.

Pedagogy

Skill Maintenance Exercises.   Retention of skills is critical to the future success of our students. To this end, nearly every exercise set includes carefully chosen exercises that review skills and concepts from preceding chapters of the text, often in preparation for the next section. In this edition, we have increased the number of skill maintenance exercises by about 50 percent.

Cumulative Review.   After every three chapters, and at the end of the text, we have also included a Cumulative Review, which reviews skills and concepts from all preceding chapters of the text. (See pages 173, 369, 535, 736, and 838.)

Synthesis Exercises.   Each exercise set ends with a set of synthesis exercises. These problems can offer opportunities for students to synthesize skills and concepts from earlier sections with the present material, or they can provide students with deeper insights into the current topic. Synthesis exercises are generally more challenging than those in the main body of the exercise set. We have increased the number of synthesis exercises by 10 percent for the Second Edition. (See pages 50, 77, 127–128, and 221–222.)

Writing Exercises.   Nearly every set of synthesis exercises begins with four writing exercises, which nearly doubles the number found in the First Edition. All writing exercises are marked with a maze icon (◈). These exercises are usually not as difficult as other synthesis exercises, but require written answers that aid in student comprehension, critical thinking, and conceptualization. Because some instructors may collect answers to writing exercises, and because more than one answer may be correct, answers to writing exercises are not listed at the back of the text. (See pages 89, 99, and 182.)

What's New in the Second Edition?

We have rewritten many key topics in response to user and reviewer feedback and have made significant improvements in design, art, and pedagogy. Detailed information about the content changes is available in the form of a Conversion Guide. Please ask your local Addison Wesley Longman sales consultant for more information. Following is a list of the major changes in this revision.

New Design

▪ The new design is more open and readable. We have increased the type size in many features to emphasize key topics. Pedagogical use of color has been increased to make it easier to see how examples unfold.

- The entire art program is new for this edition. We have ensured the accuracy of the graphical art through the use of computer-generated graphs. Color in the graphical art is used pedagogically and precisely to help the student visualize the mathematics. (See pages 32, 159, and 428.)

Technology Connections

- The Technology Connections, which appear throughout the text, integrate technology, increase the understanding of concepts through visualization, encourage exploration, and motivate discovery learning. Due to user demand, we have more than doubled the number of these strictly optional features in the Second Edition. Optional Technology Connection exercises appear in many exercise sets and are marked with a grapher icon ( ). (See pages 138, 145, and 401.)

Collaborative Corners

- In today's professional world, teamwork is essential. We have included optional Collaborative Corner features throughout the text to allow students to work in groups to solve problems. There is an average of three Collaborative Corner activities per chapter, each one appearing after the appropriate section's exercise set. (See pages 128, 329, and 441.) Additional Collaborative Corner activities and suggestions for directing collaborative learning appear in the *Printed Test Bank/Instructor's Resource Guide.*

World Wide Web Integration

- The World Wide Web is a powerful resource that reaches more and more people every day. In an effort to get students more involved in using this resource, we have enhanced every chapter opener to include a World Wide Web address **http://hepg.awl.com/be/comb_2**. Students can go to this page on the World Wide Web to further explore the subject matter of the chapter opening application. Selected exercise sets also have additional practice-problem worksheets that can be downloaded over the Internet. These exercise sets are listed on the inside back cover.

Content Changes

A variety of content changes have been made throughout the text. Some of the more significant changes are listed below.

- In Chapter 1, Section 1.2 is now condensed for better flow. The coverage of rational numbers in Section 1.4 has been improved. The examples in Section 1.8 have been improved to prepare students for factoring in Chapter 5.
- In Chapter 2, we have increased our use of real data in examples and exercises to convey the universality of problem solving.
- In Chapter 3, we have merged subsections in Section 3.2 for better flow, and we illustrate in greater depth the use of graphs to represent solutions. Section 3.4 introduces the student to the tremendously important concept of rate. In Section 3.5, the study of rate is linked to the concept of slope.

- In Chapter 4, Section 4.2 has been reorganized for better flow and graphs are used to estimate the value of a polynomial for selected values. New geometric applications in Sections 4.3 and 4.6 help students to better visualize the study of polynomials.
- Chapter 7 now includes a new section of applications in the exercise sets to help the student review slope, a topic introduced in Chapter 3. Section 7.2 now includes more discussion of visualizing domain and range on a graph. These changes encourage students to use their visualization skills and to read and interpret graphs.
- In Chapter 9, Section 9.2 now contains more material on domains of functions in order to better prepare students for Chapter 10. Section 9.3 now includes more graphing for increased visualization. This change will also aid students in relating inequalities to equations.
- In Chapter 11, Section 11.1, we have included more work with quadratic functions and more exercises with imaginary solutions to better prepare students for college algebra. Section 11.4 now includes more on writing equations from solutions to build mathematical understanding.
- We have also added a Review Appendix to this edition for those students who need a review of elementary algebra topics before undertaking the intermediate algebra portion of the text.

Supplements for the Instructor

Instructor's Edition

The *Instructor's Edition* is a specially bound version of the student text with worked-out solutions to the even-numbered exercises and answers to the odd-numbered exercises at the back of the text.

Instructor's Solutions Manual

The *Instructor's Solutions Manual* contains worked-out solutions to all exercises in the exercise sets.

Printed Test Bank/Instructor's Resource Guide by Donna DeSpain

This supplement contains the following:

- Extra practice problems with more sections covered than in the Second Edition
- Black-line masters of grids and number lines for transparency masters or test preparation
- A videotape index and section cross references to the tutorial software packages available with this text

- Additional collaborative learning activities and suggestions
- A syllabus conversion guide from the First Edition to the Second Edition

The test bank portion contains the following:

- Six alternative free-response test forms for each chapter
- Two multiple-choice versions of each chapter test
- Eight final examinations: three with questions organized by chapter, three with questions organized by type, and two with multiple-choice questions

All test forms have been completely rewritten.

TestGen—EQ

TestGen—EQ is a computerized test generator that allows instructors to select test questions manually or randomly from selected topics. The test questions are algorithm-driven so that regenerated number values maintain problem types and provide a large number of test items in both multiple-choice and open-ended formats for one or more test forms. Test items can be viewed on screen, and the built-in question editor lets instructors modify existing questions or add new questions that include pictures, graphs, math symbols, and variable text and numbers. Instructors can also customize both the look and content of test banks and tests. Test questions are easily transferred from the test bank to a test and can be sorted, searched, and displayed in various ways. Available in both Windows and Macintosh versions, TestGen—EQ is free to qualifying adopters.

QuizMaster—EQ

QuizMaster—EQ enables instructors to create and save tests and quizzes using TestGen—EQ so students can take them on a computer network. Instructors can set preferences for how and when tests are administered. QuizMaster—EQ automatically grades the exams and allows the instructor to view or print a variety of reports for individual students, classes, or courses. This software is available for both Windows and Macintosh and is fully networkable. QuizMaster—EQ is free to qualifying adopters.

InterAct Math Plus

This software, available for both Windows and Macintosh, combines course management and on-line testing with the features of InterAct Math Tutorial Software (see *InterAct Math Tutorial* under Supplements for the Student) to create an invaluable teaching resource. Contact your local Addison Wesley Longman sales consultant for a demonstration.

Supplements for the Student

Student's Solutions Manual by Judith A. Penna

This manual contains completely worked-out solutions with step-by-step annotations for all the odd-numbered exercises in the exercise sets. Solution processes match those illustrated in the text. The manual also contains answers for all the even-numbered exercises in the text.

Videotapes

Developed especially for the Bittinger/Ellenbogen texts, these videotapes feature an engaging team of lecturers presenting material from every section of the text in an interactive format. The lecturers' presentations support an approach that emphasizes visualization and problem solving. The videotapes are free to qualifying adopters.

InterAct Math Tutorial Software

InterAct Math Tutorial Software includes exercises that are linked one-to-one with the odd-numbered exercises in the textbook. Every exercise is accompanied by an example and an interactive guided solution designed to involve students in the solution process and to help them identify precisely where they are having trouble. In addition, the software recognizes common student errors and provides students with appropriate customized feedback. Available for both Windows or Macintosh and fully networkable, Interact Math Tutorial Software is free to qualifying adopters.

World Wide Web Supplement http://hepg.awl.com/be/comb_2

This on-line supplement contains links to web sites related to the chapter openers in the text. It also contains extra practice-problem worksheets for selected text sections. Students can download these worksheets and use them for practice, as needed. Text sections that correlate with on-line worksheets are listed on the inside back cover.

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Allan Robert Marshall, *Cuesta College*
Carol Metz, *Westchester Community College*
Jane Murphy, *Middlesex Community College*
Paul O'Heron, *Broome Community College*
Mark Omodt, *Anoka Ramsey Community College*
Mark Parker, *Shoreline Community College*
Linda Reist, *Macomb County Community College*
Eveline Robbins, *Gainesville College*
Barbara Schewe, *Anoka Ramsey Community College*
Julia Schroeder, *John A. Logan College*
Patty Schwarzkopf, *University of Delaware*
Andrea Seavitt, *Henry Ford Community College*
Rick Serpone, *Mesa Community College*
Mahendra Singhal, *University of Wisconsin—Parkside*
Lois Speg, *Delaware Technical Community College*
Marjorie Stinespring, *Chicago State University*
June Strohm, *Pennsylvania State University—DuBois*
Kathy Struve, *Columbus State Community College*
Diane Tesar, *South Suburban College*
Sharon Testone, *Onondaga Community College*
Jane Theiling, *Dyersburg State Community College*
Carl Thomas, *Napa Valley College*
Gerry Tolimante, *Mesa Community College*
Kathy Tomsich, *Anoka Ramsey Community College*
Marilyn Treder, *Rochester Community College*
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M.L.B.
D.J.E.
B.L.J.

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