

INTRODUCTORY & INTERMEDIATE ALGEBRA

for college students

SECOND EDITION



Blitzer

Includes
Chapter Test Prep
Video CDs

Second Edition

Introductory and Intermediate Algebra for College Students

Robert Blitzer

Miami-Dade College



Upper Saddle River, New Jersey 07458

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PREFACE

Introductory and Intermediate Algebra for College Students, Second Edition, provides comprehensive, in-depth coverage of the topics required in a course combining the study of introductory and intermediate algebra. The book is written for college students who have no previous experience in algebra and for those who need a review of basic algebraic concepts before moving on to intermediate algebra. I wrote the book to help diverse students, with different backgrounds and career plans, to succeed in a combined introductory and intermediate algebra course. *Introductory and Intermediate Algebra for College Students*, Second Edition, has two primary goals:

1. To help students acquire a solid foundation in the skills and concepts of introductory and intermediate algebra, without the repetition of topics in two separate texts.
2. To show students how algebra can model and solve authentic real-world problems.

One major obstacle in the way of achieving these goals is the fact that very few students actually read their textbook. This has been a regular source of frustration for me and for my colleagues in the classroom. Anecdotal evidence gathered over years highlights two basic reasons why students do not take advantage of their textbook:

- “I’ll never use this information.”
- “I can’t follow the explanations.”

I’ve written every page of the Second Edition with the intent of eliminating these two objections. The ideas and tools I’ve used to do so are described in the features that follow. These features and their benefits are highlighted for the student in “A Brief Guide to Getting the Most from This Book” that appears inside the front cover.

What’s New in the Second Edition?

I believe students and instructors will welcome the following new features:

- **Practice Plus Exercises.** More challenging practice exercises that often require students to combine several skills or concepts have been added to the exercise sets. The 750 Practice Plus Exercises in the Second Edition, averaging 10 of these exercises per exercise set, provide instructors with the option of creating assignments that take practice exercises to a more challenging level than in the previous edition.
- **Mid-Chapter Check Points.** At approximately the midway point in each chapter, an integrated set of review exercises allows students to review and assimilate the skills and concepts they learned separately over several sections. The 285 exercises that make up the Mid-Chapter Check Points, averaging 20 exercises per check point, are of a mixed nature, requiring students to discriminate which concepts or skills to apply. The Mid-Chapter Check Points should help students bring together the different objectives covered in the first half of the chapter before they move on to the material in the remainder of the chapter.

- **New Applications and Real-World Data.** I researched hundreds of books, magazines, almanacs, and online data sites to prepare the Second Edition. As a result, many new, innovative applications, supported by data that extend as far up to the present as possible, appear in 318 new application exercises and examples.
- **Over 2000 New Examples and Exercises.** In addition to the 750 Practice Plus Exercises, the 285 Mid-Chapter Check Points, and the 318 new application exercises, the Second Edition contains 736 new exercises that appear in the various categories of the exercise sets.
- **Increased Study Tip Boxes.** The book's Study Tip boxes offer suggestions for problem solving, point out common errors to avoid, and provide informal hints and suggestions. These invaluable hints appear in greater abundance in the Second Edition.
- **Increased Use of Function Notation in Equation Solving.** Because functions are the core of Chapters 8 through 14 (the intermediate algebra portion of the course), students are repeatedly shown how functions relate to equations and graphs. Many of the new practice exercises in the second half of the book use function notation in solving both equations and inequalities.
- **Graphical and Numerical Approaches to Problems.** Although the use of graphing utilities is optional, students can look at the new side-by-side features in Using Technology boxes and, with the assistance of the explanatory voice balloons, begin to understand both graphical and numerical approaches to problems even if they are not using a graphing utility in the course.
- **Chapter Test Prep Video CDs.** Packaged at the back of the text, these video CDs provide students with step-by-step solutions for each of the exercises in the book's chapter tests.

What Content and Organizational Changes Have Been Made to the Second Edition?

- Section 1.1 (Fractions) contains new discussions on mixed numbers and improper fractions, as well as the use of prime factorizations in reducing fractions and finding LCDs.
- Section 2.4 (Formulas and Percents) includes new discussions on percent increase, percent decrease, and ways percents are frequently used incorrectly.
- Section 5.6 (Long Division of Polynomials; Synthetic Division) includes long division problems with nonlinear divisors.
- Section 7.6 (Solving Rational Equations) contains a new discussion on solving formulas with rational expressions for a variable.
- The Mid-Textbook Check Point (Are You Prepared for Intermediate Algebra?) allows students to review introductory algebra topics before starting the intermediate algebra portion of the book. Presented in the format of the new Mid-Chapter Check Points and appearing immediately before Chapter 8 (rather than as an appendix in the back of the book, as in the previous edition), the Mid-Textbook Check Point gives students a fast way to review and practice prerequisite skills needed in intermediate algebra.

- Chapter 8 (Basics of Functions), the book's transitional chapter into intermediate algebra, is now devoted exclusively to functions. An integrated graphing functional approach is emphasized throughout the remainder of the book. Because both functions and systems of linear equations in three variables were included in this chapter in the previous edition, the following organizational changes were made:
 - Systems of linear equations in three variables are discussed in the final section of Chapter 4 (Systems of Linear Equations).
 - Matrix solutions to linear systems and Cramer's Rule, topics frequently covered in college algebra, are included in separate appendices.
 - Composite and inverse functions, appearing in the chapter on exponential and logarithmic functions in the previous edition, are discussed in the final section of Chapter 8. Instructors who wish to include these topics in basics of functions can now do so, even if exponential and logarithmic functions are not covered in the course.
- Section 8.1 (Introduction to Functions) provides a new introduction to relations and functions using *Celebrity Jeopardy*'s highest earners and their winnings. Also included is a new discussion of identifying the domain and the range of a function from its graph.
- Section 11.1 (The Square Root Property and Completing the Square; Distance and Midpoint Formulas) now includes a discussion of the distance between two points in rectangular coordinates, as well as the midpoint formula. Distance and midpoint formulas, appearing in the chapter on conic sections in the previous edition, follow naturally from the square root property and can now be included in the course even if conic sections are not covered.
- Section 11.5 (Polynomial and Rational Inequalities) is a reworked and expanded discussion of quadratic and rational inequalities from the previous edition. Solution procedures are now developed and organized around polynomial functions, rational functions, and their graphs.
- Section 12.5 (Exponential Growth and Decay; Modeling Data) contains new examples involving choosing models for data before technology is used to obtain these models.
- Section 14.4 (The Binomial Theorem) now gives the formula for $(r + 1)$ st term, rather than the r th term, of the expansion of $(a + b)^n$. Many students find the formula for the $(r + 1)$ st term easier to work with when finding a particular term in a binomial expansion.
- Section 14.6 (Probability) contains new probability examples using tables with real-world data.

What Familiar Features Have Been Retained in the Second Edition?

The features described below that helped make the First Edition so popular continue in the Second Edition.

- **Detailed Worked-Out Examples.** Each worked example is titled, making clear the purpose of the example. Examples are clearly written and provide students with detailed step-by-step solutions. No steps are omitted and each step is thoroughly explained to the right of the mathematics.
- **Check Point Examples.** Each example is followed by a similar matched problem, called a Check Point, offering students the opportunity to test their understanding of the example by working a similar exercise. The answers to the Check Points are provided in the answer section.

- **Explanatory Voice Balloons.** Voice balloons are used in a variety of ways to demystify mathematics. They translate algebraic ideas into everyday English, help clarify problem-solving procedures, present alternative ways of understanding concepts, and connect problem solving to concepts students have already learned.
- **Extensive and Varied Exercise Sets.** An abundant collection of exercises is included in an exercise set at the end of each section. Exercises are organized within seven category types: Practice Exercises, Practice Plus Exercises, Application Exercises, Writing in Mathematics, Critical Thinking Exercises, Technology Exercises, and Review Exercises. This format makes it easy to create well-rounded homework assignments. The order of the practice exercises is exactly the same as the order of the section's worked examples. This parallel order enables students to refer to the titled examples and their detailed explanations to achieve success working the practice exercises.
- **Chapter-Opening and Section-Opening Scenarios.** Every chapter and every section open with a scenario presenting a unique application of algebra in students' lives outside the classroom. These scenarios are revisited in the course of the chapter or section in an example, discussion, or exercise.
- **Section Objectives.** Learning objectives open every section. These objectives help students recognize and focus on the section's most important ideas. The objectives are stated in the margin at their point of use.
- **Chapter Review Grids.** Each chapter contains a review chart that summarizes the definitions and concepts in every section of the chapter. Examples that illustrate these key concepts are also included in the chart.
- **End-of-Chapter Materials.** A comprehensive collection of review exercises for each of the chapter's sections follows the review grid. This is followed by a chapter test that enables students to test their understanding of the material covered in the chapter. Beginning with Chapter 2, each chapter concludes with a comprehensive collection of mixed cumulative review exercises.
- **Graphing.** Chapter 1 contains an introduction to graphing, a topic that is integrated throughout the book. Line, bar, circle, and rectangular coordinate graphs that use real data appear in nearly every section and exercise set. Many examples and exercises use graphs to explore relationships between data and to provide ways of visualizing a problem's solution.
- **Geometric Problem Solving.** Chapter 2 contains a section on problem solving in geometry that teaches geometric concepts that are important to a student's understanding of algebra. There is a frequent emphasis on problem solving in geometric situations, as well as on geometric models that allow students to visualize algebraic formulas.
- **Thorough, Yet Optional Technology.** Although the use of graphing utilities is optional, they are utilized in Using Technology boxes to enable students to visualize and gain numerical insight into algebraic concepts. The use of graphing utilities is also reinforced in the technology exercises appearing in the exercise sets for those who want this option. With the book's early introduction to graphing, students can look at the calculator screens in the Using Technology boxes and gain an increased understanding of an example's solution even if they are not using a graphing utility in the course.
- **Study Tips.** Study Tip boxes appear throughout the book.

- **Enrichment Essays.** These discussions provide historical, interdisciplinary, and otherwise interesting connections to the algebra under study, showing students that math is an interesting and dynamic discipline.
- **Discovery.** Discover for Yourself boxes, found throughout the text, encourage students to further explore algebraic concepts. These explorations are optional and their omission does not interfere with the continuity of the topic under consideration.
- **Chapter Projects.** At the end of each chapter is a collaborative activity that gives students the opportunity to work cooperatively as they think and talk about mathematics. Additional group projects can be found in the *Instructor's Resource Manual*. Many of these exercises should result in interesting group discussions.

Resources for the Instructor

Print

Annotated Instructor's Edition (ISBN: 0-13-149260-8)

- Answers appear in place on the same text page as exercises or in the Graphing Answer Section
- Answers to all exercises in the exercise sets, Mid-Chapter Check Points, Chapter Reviews, Chapter Tests, and Cumulative Reviews

Instructor's Solutions Manual (ISBN: 0-13-192178-9)

- Detailed step-by-step solutions to the even-numbered section exercises
- Solutions to every exercise (odd and even) in the Mid-Chapter Check Points, Chapter Reviews, Chapter Tests, and Cumulative Reviews
- Solution methods reflect those emphasized in the text.

Instructor's Resource Manual with Tests (ISBN: 0-13-192177-0)

- Six test forms per chapter—3 free response, 3 multiple choice
- Two *Cumulative Tests* for all even-numbered chapters
- Two *Final Exams*
- Answers to all test items
- *Mini-Lectures* for each section with brief lectures including key learning objectives, classroom examples, and teaching notes
- Additional *Activities*, two per chapter, providing short group activities in a convenient ready-to-use handout format
- *Skill Builders* providing an enhanced worksheet for each text section, including concept rules, explained examples, and extra problems for students
- Twenty *Additional Exercises* per section for added test exercises or worksheets

Media

Lab Pack CD Lecture Series (ISBN: 0-13-192180-0)

- Organized by section, *Lab Pack CD Lecture Series* contains problem-solving techniques and examples from the textbook.

- Step-by-step solutions to selected exercises from each textbook section marked with a video icon

TestGen (ISBN: 0-13-192181-9)

- Windows and Macintosh compatible
- Algorithmically driven, text-specific testing program covering all objectives of the text
- Chapter Test file for each chapter provides algorithms specific to exercises in each *Chapter Test* from the text.
- Edit and add your own questions with the built-in question editor, which allows you to create graphs, import graphics, and insert math notation.
- Create a nearly unlimited number of tests and worksheets, as well as assorted reports and summaries.
- Networkable for administering tests and capturing grades online, or on a local area network

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- Entire textbook online with links to multimedia resources including video clips, practice exercises, and animations that are correlated to the textbook examples and exercises
- Homework and test managers to select and assign online exercises correlated directly to the text
- A personalized Study Plan generated based on student test results. The Study Plan links directly to unlimited tutorial exercises for the areas students need to study and retest, so they can practice until they have mastered the skills and concepts.
- *MyMathLab Gradebook* allows you to track all of the online homework, tests, and tutorial work while providing grade control.
- Import *TestGen* tests

MathXL[®]

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A powerful online homework, tutorial, and assessment system that allows instructors to:

- Create, edit, and assign online homework and tests using algorithmically generated exercises correlated at the objective level to the textbook
- Track student work in *MathXL*'s online gradebook

Resources for the Student



Student Study Pack (ISBN: 0-13-154936-7)

Get math help when YOU need it! The *Student Study Pack* provides the ultimate set of support resources to go along with the text. The *Student Study Pack* includes the *Student Solutions Manual*, access to the *Prentice Hall Math Tutor Center*, and the *CD Lecture Videos*.

Print

Student Solutions Manual (ISBN: 0-13-192179-7)

- Solutions to all odd-numbered section exercises
- Solutions to every exercise (odd and even) in the Mid-Chapter Check Points, Chapter Reviews, Chapter Tests, and Cumulative Reviews
- Solution methods reflect those emphasized in the text.

Media

MyMathLab

An all-in-one, online tutorial, homework, assessment, course management tool with the following student features:

- The entire textbook online with links to multimedia resources including video clips, practice exercises, and animations correlated to the textbook examples and exercises
- Online tutorial, homework, and tests
- A personalized Study Plan based on student test results. The Study Plan links directly to unlimited tutorial exercises for the areas students need to study and retest, so they can practice until they have mastered the skills and concepts.

MathXL[®]

A powerful online homework, tutorial, and assessment system that allows students to:

- Take chapter tests and receive a personalized study plan based on their test results
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- Practice exercises accompanied by an example and a guided solution
- Tutorial video clips within the exercise to help students visualize concepts
- Easy-to-use tracking of student activity and scores and printed summaries of students' progress

Chapter Test Prep Video CDs (ISBN: 0-13-192174-6)

- Provide step-by-step video solutions to each exercise in each Chapter Test in the textbook

PH Tutor Center (ISBN: 0-13-064604-0)

- Tutorial support via phone, fax, or email
- Staffed by developmental math faculty
- Available 5 days a week, 7 hours a day

Acknowledgments

An enormous benefit of authoring a successful series is the broad-based feedback I receive from the students, dedicated users, and reviewers. Every change to this edition is the result of their thoughtful comments and suggestions. I would like to express my appreciation to all the reviewers, whose collective insights form the backbone of this revision. In particular, I would like to thank:

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I hope that my love for learning, as well as my respect for the diversity of students I have taught and learned from over the years, is apparent throughout this new edition. By connecting algebra to the whole spectrum of learning, it is my intent to show students that their world is profoundly mathematical, and indeed, π is in the sky.

Robert Blitzer



TO THE STUDENT

I've written this book so that you can learn about the power of algebra and how it relates directly to your life outside the classroom. All concepts are carefully explained, important definitions and procedures are set off in boxes, and worked-out examples that present solutions in a step-by-step manner appear in every section. Each example is followed by a similar matched problem, called a Check Point, for you to try so that you can actively participate in the learning process as you read the book. (Answers to all Check Points appear in the back of the book.) Study Tips offer hints and suggestions and often point out common errors to avoid. A great deal of attention has been given to applying algebra to your life to make your learning experience both interesting and relevant.

As you begin your studies, I would like to offer some specific suggestions for using this book and for being successful in this course:

- 1. Read the book.** Read each section with pen (or pencil) in hand. Move through the worked-out examples with great care. These examples provide a model for doing exercises in the exercise sets. As you proceed through the reading, do not give up if you do not understand every single word. Things will become clearer as you read on and see how various procedures are applied to specific worked-out examples.
- 2. Work problems every day and check your answers.** The way to learn mathematics is by doing mathematics, which means working the Check Points and assigned exercises in the exercise sets. The more exercises you work, the better you will understand the material.
- 3. Review for quizzes and tests.** After completing a chapter, study the chapter review chart, work the exercises in the Chapter Review, and work the exercises in the Chapter Test. Answers to all these exercises are given in the back of the book.

The methods that I've used to help you read the book, work the problems, and review for tests are described in "A Brief Guide to Getting the Most from This Book" that appears inside the front cover. Spend a few minutes reviewing the guide to familiarize yourself with the book's features and their benefits.

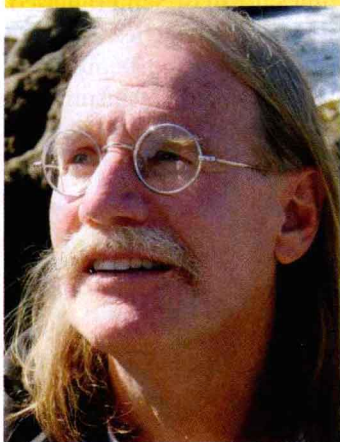
- 4. Use the resources available with this book.** Additional resources to aid your study are described following the guide to getting the most from your book. These resources include a Solutions Manual, a Chapter Test Prep Video CD, MyMathLab, an online version of the book with links to multimedia resources, MathXL[®], an online homework, tutorial, and assessment system of the text, and tutorial support at the PH Tutor Center.
- 5. Attend all lectures.** No book is intended to be a substitute for valuable insights and interactions that occur in the classroom. In addition to arriving for lecture on time and being prepared, you will find it useful to read the section before it is covered in lecture. This will give you a clear idea of the new material that will be discussed.

I wrote this book in Point Reyes National Seashore, 40 miles north of San Francisco. The park consists of 75,000 acres with miles of pristine surf-washed beaches, forested ridges, and bays bordered by white cliffs. It was my hope to convey the beauty and excitement of mathematics using nature's unspoiled beauty as a source of inspiration and creativity. Enjoy the pages that follow as you empower yourself with the algebra needed to succeed in college, your career, and in your life.

Regards,

Bob

Robert Blitzer



ABOUT THE AUTHOR

Bob Blitzer is a native of Manhattan and received a Bachelor of Arts degree with dual majors in mathematics and psychology (minor: English literature) from the City College of New York. His unusual combination of academic interests led him toward a Master of Arts in mathematics from the University of Miami and a doctorate in behavioral sciences from Nova University. Bob is most energized by teaching mathematics and has taught a variety of mathematics courses at Miami-Dade College for nearly 30 years. He has received numerous teaching awards, including Innovator of the Year from the League for Innovations in the Community College, and was among the first group of recipients at Miami-Dade College for an endowed chair based on excellence in the classroom. In addition to *Introductory and Intermediate Algebra for College Students*, Bob has written *Introductory Algebra for College Students*, *Intermediate Algebra for College Students*, *Essentials of Intermediate Algebra for College Students*, *Essentials of Introductory and Intermediate Algebra for College Students*, *Algebra for College Students*, *Thinking Mathematically*, *College Algebra*, *Algebra and Trigonometry*, and *Precalculus*, all published by Prentice Hall.

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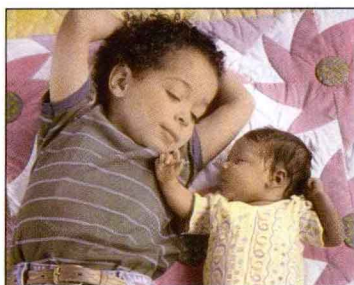
A BRIEF GUIDE TO GETTING THE MOST FROM THIS BOOK

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