



ANNOTATED INSTRUCTOR'S EDITION

BEGINNING ALGEBRA

FIFTH
EDITION

John Tobey Jeffrey Slater

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Beginning Algebra

Fifth Edition

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This Annotated Instructor's Edition contains teaching tips that appear in the margin of the text pages. In addition, the answers to each exercise, pretest, chapter test, and cumulative test are displayed in blue next to the exercise or problem. Otherwise this Annotated Instructor's Edition is identical to your students' textbooks. When ordering the text for your students, be sure to use the ISBN for the student text, which is 0-13-090951-3 for paperback and 0-13-093228-0 for case bound.

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Upper Saddle River, NJ 07458

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Upper Saddle River, NJ 07458

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Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

AIE ISBN 0-13-090953-X
Student ISBN (paperback) 0-13-090951-3
Student ISBN (case) 0-13-093228-0

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Editora Prentice-Hall do Brasil, Ltda., *Rio de Janeiro*

*This book is dedicated to the memory of
Lexie Tobey and John Tobey, Sr.
They have left a legacy of love, a memory
of four decades of faithful teaching, and a sense
of helping others that will influence generations to come.
For their grandchildren they have left
an inspiring model of a loving family,
true character, and service
to God and community.*

Preface

To the Instructor

We share a partnership with you. For over thirty years we have taught mathematics courses at North Shore Community College. Each semester we join you in the daily task of sharing the knowledge of mathematics with students who often struggle with this subject. We enjoy teaching and helping students—and we are confident that you share these joys with us.

Mathematics instructors and students face many challenges today. *Beginning Algebra* was written with these needs in mind. This textbook explains mathematics slowly, clearly, and in a way that is relevant to everyday life for the college student. As with previous editions, special attention has been given to problem solving in the fifth edition. This text is written to help students organize the information in any problem-solving situation, to reduce anxiety, and to provide a guide that enables students to become confident problem solvers.

One of the hallmark characteristics of *Beginning Algebra* that makes the text easy to learn and teach from is the building-block organization. Each section is written to stand on its own, and each homework set is completely self-testing. Exercises are paired and graded and are of varying levels and types to ensure that all skills and concepts are covered. As a result, the text offers students an effective and proven learning program suitable for a variety of course formats—including lecture-based classes; discussion-oriented classes; distance learning centers; modular, self-paced courses; mathematics laboratories; and computer-supported centers.

Beginning Algebra is part of a series that includes the following:

Tobey/Slater, *Basic College Mathematics*, Fourth Edition

Blair/Tobey/Slater, *Prealgebra*, Second Edition

Tobey/Slater, *Beginning Algebra*, Fifth Edition

Tobey/Slater, *Intermediate Algebra*, Fourth Edition

Tobey/Slater, *Beginning and Intermediate Algebra*

We have visited and listened to teachers across the country and have incorporated a number of suggestions into this edition to help you with the particular learning delivery system at your school. The following pages describe the key continuing features and changes in the fifth edition.

Key Features and Changes in the Fifth Edition

Developing Problem-Solving Abilities

We are committed as authors to producing a textbook that emphasizes mathematical reasoning and problem-solving techniques as recommended by AMATYC, NCTM, AMS, NADE, MAA, and other bodies. To this end, the problem sets are built on a wealth of real-life and real-data applications. Unique problems have been developed and incorporated into the exercise sets that help train students in data interpretation, mental mathematics, estimation, geometry and graphing, number sense, critical thinking, and decision making.

More Applied Problems

The exercises and applications have been extensively revised. Numerous real-world and real-data application problems show students the relevance of the math they are learning. The applications relate to everyday life, global issues beyond the borders of the United States, and other academic disciplines. Many include source citations. The

number of real-data applications has significantly increased. Roughly 30 percent of the applications have been contributed by actual students based on scenarios they have encountered in their home or work lives.

Math in the Media

New Math in the Media applications appear at the end of each chapter to offer students yet another opportunity to see why developing mastery of mathematical concepts enhances their understanding of the world around them. The applications are based on a brief clip, illustration, or information from familiar media sources—either online or print. The exercises may ask students to interpret or verify information, perform calculations, make decisions or predictions, or provide a rationale for their responses.

Putting Your Skills to Work Applications

This highly successful feature has been revised in the fifth edition. There are 10 new Putting Your Skills to Work applications in the new edition. These nonroutine application problems challenge students to synthesize the knowledge they have gained and apply it to a totally new area. Each problem is specifically arranged for independent and cooperative learning or group investigation of mathematical problems that pique student interest. Students are given the opportunity to help one another discover mathematical solutions to extended problems. The investigations feature open-ended questions and extrapolation of data to areas beyond what is normally covered in such a course.

Internet Connections

As an integral part of each Putting Your Skills to Work problem, students are exposed to an interesting application of the Internet and encouraged to continue their investigations. This use of technology inspires students to have confidence in their abilities to successfully use mathematics. In the fifth edition, the Internet Connections have been completely revised and updated.

The companion Web site (http://www.prenhall.com/tobey_beginning) now features annotated links to help students navigate the sites more efficiently and to provide a more user-friendly experience.

Increased Integration and Emphasis on Geometry

Due to the emphasis on geometry on many statewide exams, geometry problems are integrated throughout the text. The new edition contains over approximately 35 percent more geometry problems. Additionally, examples and exercises that incorporate a principle of geometry are now marked with a triangle icon for easy identification.

Blueprint for Problem Solving

The successful Mathematics Blueprint for Problem Solving strengthens problem-solving skills by providing a consistent and interactive outline to help students organize their approach to problem solving. Once students fill in the blueprint, they can refer back to their plan as they do what is needed to solve the problem. Because of its flexibility, this feature can be used with single-step problems, multistep problems, applications, and nonroutine problems that require problem-solving strategies. Students will not need to use the blueprint to solve every problem. It is available for those faced with a problem with which they are not familiar, to alleviate anxiety, to show them where to begin, and to assist them in the steps of reasoning.

Developing Your Study Skills

This highly successful feature has been retained in the new edition. The boxed notes are integrated throughout the text to provide students with techniques for improving their study skills and succeeding in math courses.

Graphs, Charts, and Tables

When students encounter mathematics in real-world publications, they often encounter data represented in a graph, chart, or table and are asked to make a reasonable conclusion based on the data presented. This emphasis on graphical interpretation is a continuing trend with the expanding technology of our day. The number of mathematical problems based on charts, graphs, and tables has been significantly increased in this edition. Students are asked to make simple interpretations, to solve medium-level problems, and to investigate challenging applied problems based on the data shown in a chart, graph, or table.

New Design

The fifth edition has a new design that enhances the accessible, student-friendly writing style. This new design includes new chapter opening applications and an improved and enhanced art program. See the walkthrough of features in the preface.

Mastering Mathematical Concepts

Text features that develop the mastery of concepts include the following:

Learning Objectives

Concise learning objectives listed at the beginning of each section allow students to preview the goals of that section.

Examples and Exercises

The examples and exercises in this text have been carefully chosen to guide students through *Beginning Algebra*. We have incorporated several different types of exercises and examples to assist your students in retaining the content of this course.

Chapter Pretests

Each chapter opens with a concise pretest to familiarize the students with the learning objectives for that particular chapter. The problems are keyed to appropriate sections of the chapter. All answers appear in the back of the book.

Practice Problems

Practice problems are found throughout the chapter, after the examples, and are designed to provide your students with immediate practice of the skills presented. The complete worked-out solution of each practice problem appears in the back of the book.

To Think About

These critical thinking questions follow some of the examples in the text and also appear in the exercise sets. They extend the concept being taught, providing the opportunity for all students to stretch their minds, to look for patterns, and to make conclusions based on their previous experience. The new edition includes an increased number of these problems.

Exercise Sets

Exercise sets are paired and graded. This design helps ease the students into the problems, and the answers provide students with immediate feedback.

Cumulative Review Problems

Each exercise set concludes with a section of cumulative review problems. These problems review topics previously covered and are designed to assist students in retaining the material. Many additional applied problems have been added to the cumulative review sections.

Graphing and Scientific Calculator Problems

Calculator boxes are placed in the margin of the text to alert students to a scientific or graphing calculator application. In the exercise section, icons indicate problems that are designed for solving with a graphing or scientific calculator.

Reviewing Mathematical Concepts

At the end of each chapter we have included problems and tests to provide students with several different formats to help them review and reinforce the ideas that they have learned. This not only assists them with this chapter, it reviews previously covered topics as well.

Chapter Organizers

The concepts and mathematical procedures covered in each chapter are reviewed at the end of the chapter in a unique chapter organizer. This device has been extremely popular with faculty and students alike. It not only lists concepts and methods, but provides a completely worked-out example for each type of problem. Students find that preparing a similar chapter organizer on their own in higher-level math courses becomes an invaluable way to master the content of a chapter of material.

Verbal and Writing Skills

These exercises provide students with the opportunity to extend a mathematical concept by allowing them to use their own words, to clarify their thinking, and to become familiar with mathematical terms.

Chapter Review Problems

These problems are grouped by section as a quick refresher at the end of the chapter. These problems can also be used by the student as a quiz of the chapter material.

Tests

Found at the end of the chapter, the chapter test is a representative review of the material from that particular chapter that simulates an actual testing format. This provides the students with a gauge to their preparedness for the actual examination.

Cumulative Tests

At the end of each chapter is a cumulative test. One-half of the content of each cumulative test is based on the math skills learned in previous chapters. By completing these tests for each chapter, the students build confidence that they have mastered not only the contents of the present chapter but the contents of the previous chapters as well.

Additional Content Changes in the Fifth Edition

- Throughout the text, explanations, definitions, and procedures have been carefully revised for greater clarity and precision.
- In Chapter 1, the section on order of operations has been moved to Section 1.5 so that all of the material on operations with real numbers is now covered together before the introduction to algebra.
- The discussion of solving linear equations in Chapter 2 now includes coverage of equations with no solution and equations with infinitely many solutions.
- Section 4.3 now offers a more thorough introduction to polynomials with the addition of new terminology at the beginning of the section and a new lesson on evaluating polynomials at the end.

Expanded and Enhanced Supplements Resource Package

The fifth edition is supported by a wealth of new supplements designed for added effectiveness and efficiency. New items include the MathPro 4.0 Explorer tutorial software together with a unique video clip feature, MathPro 5—the new online version of the popular tutorial program—providing online access anytime/anywhere and enhanced course management; a new computerized testing system—TestGenEQ with QuizMaster-EQ; all new lecture videos; lecture videos digitized on CD-ROM; Prentice Hall Tutor Center; and options for online and distance learning courses. Please see the list of supplements and descriptions.

Options for Online and Distance Learning

For maximum convenience, Prentice Hall offers online interactivity and delivery options for a variety of distance learning needs. Instructors may access or adopt these in conjunction with this text, *Beginning Algebra*, Fifth Edition.

Companion Web Site

Visit http://www.prenhall.com/tobey_beginning

The companion Web site includes basic distance learning access to provide links to the text's Internet Connections activities. For the fifth edition the Internet Connections activities have been completely revised and updated. The Web site now features annotated links to facilitate student navigation of the sites associated with the exercises. Links to additional sites are also included.

This text-specific site offers students an online study guide via online self-quizzes. Questions are graded and students can e-mail their results. Syllabus Manager gives professors the option of creating their own online custom syllabus. Visit the Web site to learn more.

WebCT

Visit <http://www.prenhall.com/demo>

WebCT includes distance learning access to content found in the Tobey/Slater companion Web site plus more. WebCT provides tools to create, manage, and use online course materials. Save time and take advantage of items such as online help, communication tools, and access to instructor and student manuals. Your college may already have WebCT software installed on its server or you may choose to download it. Contact your local Prentice Hall sales representative for details.

BlackBoard

Visit <http://www.prenhall.com/demo>

For distance learning access to content and features from the Tobey/Slater companion Web site plus more. BlackBoard provides simple templates and tools to create, manage, and use online course materials. Take advantage of items such as online help, course management tools, communication tools, and access to instructor and student manuals. Contact your local Prentice Hall sales representative for details.

CourseCompass™ powered by BlackBoard

Visit <http://www.prenhall.com/demo>

For distance learning access to content and features from the Tobey/Slater companion Web site plus more. Prentice Hall content is preloaded in a customized version of BlackBoard 5. CourseCompass™ provides all of BlackBoard 5's powerful course management tools to create, manage, and use online course materials. Contact your local Prentice Hall sales representative for details.

Supplements for the Instructor

Printed Resources

Annotated Instructor's Edition (ISBN: 0-13-090953-X)

- Complete student text.
- Answers appear in place on the same text page as exercises.
- Teaching Tips placed in the margin at key points where students historically need extra help.
- Answers to all exercises in pretests, review problems, tests, cumulative tests, diagnostic pretest, and practice final.

Instructor's Solutions Manual (ISBN: 0-13-092423-7)

- Detailed step-by-step solutions to the even-numbered exercises.
- Solutions to every exercise (odd and even) in the diagnostic pretest, pretests, review problems, tests, cumulative tests, and practice final.
- Solution methods reflect those emphasized in the text.

Instructor's Resource Manual with Tests (ISBN: 0-13-092424-5)

- Nine test forms per chapter—6 free response, 3 multiple choice. Two of the free-response tests are cumulative in nature.
- Four forms of final examination.
- Answers to all items.

Media Resources

New TestGen-EQ with QuizMaster-EQ (Windows/Macintosh) (ISBN: 0-13-092524-1)

- Algorithmically driven, text-specific testing program.
- Networkable for administering tests and capturing grades online.
- The built-in Question Editor allows you to edit or add your own questions to create a nearly unlimited number of tests and worksheets.
- Use the Function Plotter to create graphs.
- Side-by-side "Testbank" window and "Test" window show your test as you build it and as it will be printed.
- Extensive symbol palettes and expression templates assist professors in writing questions that include specialized tables and notation.
- Tests can be easily exported to HTML so they can be posted to the Web for student practice.
- QuizMaster-EQ tests can be used for practice and graded tests. Instructors can set preferences to determine test availability, time limits, and number of tries.
- QuizMaster-EQ provides detailed exam reports for individual students, classes, or the course.

New MathPro Explorer 4.0

Network Version for Windows/Macintosh (ISBN 0-13-092518-7)

- Enables instructors to create either customized or algorithmically generated practice tests from any section of a chapter, or a test of random items.
- Includes an e-mail function for network users, enabling instructors to send a message to a specific student or an entire group.
- Network-based reports and summaries for a class or student and for cumulative or selected scores are available.

New MathPro 5 Anytime. Anywhere. With Assessment.

- The popular MathPro tutorial software available over the Internet.
- Online tutorial access—anytime/anywhere.
- Enhanced course management tools.

Companion Web Site

Visit http://www.prenhall.com/tobey_beginning

- Internet Connections activities have been completely revised and updated. Annotated links facilitate student navigation of the sites associated with the Internet Connections exercises.
- Additional links provided to sites of interest or resources.
- Provides an online study guide via self-quizzes. Questions are graded and students can e-mail their results.
- Syllabus Manager gives professors the option of creating their own online custom syllabus. Visit the Web site to learn more.

Supplements for Students

Printed Resources

Student Solutions Manual (ISBN: 0-13-092417-2)

- Solutions to all odd-numbered exercises.
- Solutions to every (odd and even) exercise found in pretests, chapter tests, reviews, and cumulative reviews.
- Solution methods reflect those emphasized in the textbook.
- Ask your bookstore about ordering.

Media Resources

New MathPro Explorer 4.0 CD-ROM (Student version: 0-13-092519-5)

- Keyed to each section of the text for text-specific tutorial exercises and instruction.
- Warm-up exercises and graded practice problems.
- Video clips, providing a problem similar to the one being attempted, explained and worked out on the board.
- Algorithmically generated exercises; includes bookmark, online help, glossary, and summary of scores for the exercises tried.
- Explorations enable students to explore concepts associated with each objective in more detail.

New MathPro 5 Anytime. Anywhere. With Assessment.

- The popular MathPro tutorial software available over the Internet.
- Online tutorial access—anytime/anywhere.

New Lecture Videos (ISBN: 0-13-092522-5)

- All-new videotapes accompany the fifth edition.
- Keyed to each section of the text.
- Key concepts are explained step-by-step.

New Digitized Lecture Videos on CD-ROM (ISBN: 0-13-092523-3)

- The entire set of *Beginning Algebra*, Fifth Edition lecture videotapes in digital form.
- Convenient access anytime to video tutorial support from a computer at home or on campus.
- Available shrink-wrapped with the text or stand-alone.

New Prentice Hall Tutor Center

- Staffed with developmental math instructors and open 5 days a week, 7 hours per day.
- Obtain help for examples and exercises in Tobey/Slater, *Beginning Algebra*, Fifth Edition via toll-free telephone, fax, or e-mail.

- The Prentice Hall Tutor Center is accessed through a registration number that may be bundled with a new text or purchased separately with a used book.
- Contact your Prentice Hall sales representative for details, or visit <http://www.prenhall.com/tutorcenter>.

Companion Web Site

Visit http://www.prenhall.com/tobey_beginning

- Internet Connections activities have been completely revised and updated. Annotated links facilitate navigation of the sites associated with the Internet Connections exercises.
- Additional links provided to sites of interest or resources.
- Provides an online study guide via self-quizzes. Questions are graded and students can e-mail their results to the instructor.

Additional Printed Material

Have your instructor contact the local Prentice Hall sales representative about the following resources:

- *How to Study Mathematics*
- *Math on the Internet: A Student's Guide*
- *Prentice Hall/New York Times, Theme of the Times Newspaper Supplement*

Acknowledgments

This book is the product of many years of work and many contributions from faculty and students across the country. We would like to thank the many reviewers and participants in focus groups and special meetings with the authors in preparation of previous editions.

Our deep appreciation to each of the following:

George J. Apostolopoulos, DeVry Institute of Technology
 Katherine Barringer, Central Virginia Community College
 Jamie Blair, Orange Coast College
 Larry Blevins, Tyler Junior College
 Robert Christie, Miami-Dade Community College
 Mike Contino, California State University at Hayward
 Judy Dechene, Fitchburg State University
 Floyd L. Downs, Arizona State University
 Barbara Edwards, Portland State University
 Janice F. Gahan-Rech, University of Nebraska at Omaha
 Colin Godfrey, University of Massachusetts, Boston
 Carl Mancuso, William Paterson College
 Janet McLaughlin, Montclair State College
 Gloria Mills, Tarrant County Junior College
 Norman Mittman, Northeastern Illinois University
 Elizabeth A. Polen, County College of Morris
 Ronald Ruemmler, Middlesex County College
 Sally Search, Tallahassee Community College
 Ara B. Sullenberger, Tarrant County Community College
 Michael Trappuzanno, Arizona State University
 Jerry Wisnieski, Des Moines Community College

In addition, we want to thank the following reviewers and focus group participants for providing splendid insight and suggestions for this new edition.

Mark Billiris, St. Petersburg Junior College
 Connie Buller, Metropolitan Community College
 Nelson Collins, Joliet Junior College
 Robert Dubuc, Jr., New England Institute of Technology
 Mary Beth Headlee, Manatee Community College
 Doug Mace, Baker College
 James Matovina, Community College of Southern Nevada
 Beverly Meyers, Jefferson College
 Nancy Meyers, University of Southern Indiana
 Wayne L. Miller, Lee College
 Sharon L. Morrison, St. Petersburg Junior College
 Jim Osborn, Baker College
 Linda Padilla, Joliet Junior College
 Cathy Panik, Manatee Community College
 Joel Rappaport, Miami-Dade Community College
 Jose Rico, Laredo Community College
 Dennis Runde, Manatee Community College
 Carolyn Gigi Smith, Armstrong Atlantic State University
 Lee Ann Spahr, Durham Technical Community College
 Richard Sturgeon, University of Southern Maine
 Margie Thrall, Manatee Community College

We have been greatly helped by a supportive group of colleagues who not only teach at North Shore Community College but who have provided a number of ideas as well as extensive help on all of our mathematics books. Also, a special word of thanks to Hank Harmeling, Tom Rourke, Wally Hersey, Bob McDonald, Judy Carter, Bob Campbell, Rick Ponticelli, Russ Sullivan, Kathy LeBlanc, Lora Connelly, Sharyn Sharaf, Donna Stefano, Elisabeth Lucas, Jenny Crawford, and Nancy Tufo. Joan Peabody has done an excellent job of typing various materials for the manuscript and her help is gratefully acknowledged. Suellen Robinson provided new problems, new ideas, new answer keys, and new perspective. Her excellent help was much appreciated. Sarah Street provided excellent help identifying geometry problems and incorporating accuracy suggestions.

We want to thank Louise Elton for providing several new applied problems and suggested applications. Error checking is a challenging task and few can do it well. So we especially want to thank Lauri Semarne and the staff of Laurel Technical Services for accuracy checking the content of the book at different stages of text preparation.

Additionally, Sherm Rosen researched the Internet Connections and provided splendid suggestions for improvements and helpful link annotations. Dave Nasby and others' work with Math in the Media is much appreciated.

Each textbook is a combination of ideas, writing, and revisions from the authors and wise editorial direction and assistance from the editors. We want to thank our Prentice Hall editor, Karin Wagner, for her helpful insight and perspective on each phase of the revision of the textbook. Her patience, her willingness to listen, and her flexibility to adapt to changing publishing decisions have been invaluable to the production of this book. Mary Beckwith, our project manager, provided daily support and encouragement as the book progressed. Her patient assistance with the art program and her attention to a variety of details was most appreciated. Kathy Sessa Frederico, our developmental editor, sifted through mountains of material and offered excellent suggestions for improvement and change. Gina Linko, our production director, kept things moving on schedule and cheerfully solved many crises.

Nancy Tobey retired from teaching and joined the team as our administrative assistant. Mailing, editing, photocopying, collating, and taping were cheerfully done

each day. A special thanks to Nancy. We could not have finished the book without you.

Book writing is impossible for us without the loyal support of our families. Our deepest thanks and love to Nancy, Johnny, Melissa, Marcia, Shelley, Rusty, and Abby. Your understanding, your love and help, and your patience have been a source of great encouragement. Finally, we thank God for the strength and energy to write and the opportunity to help others through this textbook.

We have spent more than 30 years teaching mathematics. Each teaching day we find that our greatest joy is helping students learn. We take a personal interest in ensuring that each student has a good learning experience in taking this course. If you have some personal comments, suggestions, or ideas for future editions of this textbook, please write to us at:

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We wish you success in this course and in your future life!

John Tobey
Jeffrey Slater

Enhanced, Student-Friendly Pedagogy

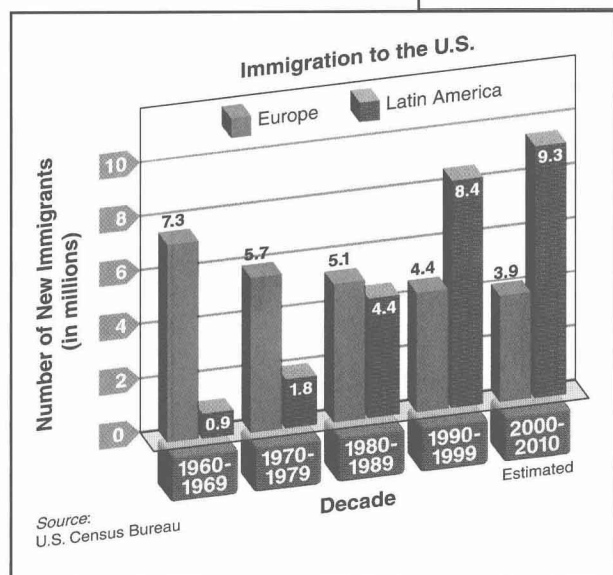
The Tobey/Slater series is a comprehensive learning system that features several pedagogical tools designed for ease of use and student success.

Chapter Organizer

The Chapter Organizer appears at the end of each chapter and summarizes key concepts and mathematical procedures. It lists concepts and methods **and** provides a completely worked-out example for each type of problem.

Chapter 4 Organizer		
Topic	Procedure	Examples
Multiplying monomials, p. 248.	$x^a \cdot x^b = x^{a+b}$ 1. Multiply the numerical coefficients. 2. Add the exponents of a given base.	$3^{12} \cdot 3^{15} = 3^{27}$ $x^3 \cdot x^4 = x^7$ $(-3x^2)(6x^3) = -18x^5$ $(2ab)(4a^2b^3) = 8a^3b^4$
Dividing monomials, p. 250.	$\frac{x^a}{x^b} = \begin{cases} x^{a-b} & \text{Use if } a \text{ is greater than } b. \\ \frac{1}{x^{b-a}} & \text{Use if } b \text{ is greater than } a. \end{cases}$ 1. Divide or reduce the fraction created by the quotient of the numerical coefficients. 2. Subtract the exponents of a given base.	$\frac{16x^7}{8x^3} = 2x^4$ $\frac{5x^3}{25x^5} = \frac{1}{5x^2}$ $\frac{-12x^5y^7}{18x^3y^{10}} = -\frac{2x^2}{3y^3}$
	$x^0 = 1 \quad \text{if } x \neq 0$	$5^0 = 1 \quad \frac{x^6}{x^6} = 1$ $w^0 = 1 \quad 3x^0y = 3y$

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Page 385

Graphs, Charts, and Tables

Problems based on charts, graphs, and tables have been significantly increased. Students make simple interpretations, solve medium-level problems, and investigate challenging applied problems based on presented data.

Developing Your Study Skills

Sprinkled throughout the text, these boxed notes provide students with techniques for improving their study skills and succeeding in math.

Developing Your Study Skills

Getting Help

Getting the right kind of help at the right time can be a key ingredient in being successful in mathematics. When you have gone to class on a regular basis, taken careful notes, methodically read your textbook, and diligently done your homework—all of which means making every effort possible to learn the mathematics—you may find that you are still having difficulty. If this is the case, then you need to seek help. Make an appointment with your instructor to find out what help is available to you. The instructor, tutoring services, a mathematics lab, videotapes, and computer software may be among the resources you can draw on. Once you discover the resources available in your school, you need to take advantage of them. Do not put it off, or you will find yourself getting behind. You cannot afford that. When studying mathematics, you must keep up with your work.

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Math in the Media

Making Gravy

Compiled by LOS ANGELES TIMES
Staff Writers

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Making gravy is simple. The secret to divine gravy is deglazing the pan and using all the browned bits stuck on the roasting pan because they hold the flavor. What frustrates most gravy makers is getting rid of the lumps. But if you make a roux, a gravy paste of flour and turkey fat stirred until smooth, that will help get rid of stubborn lumps.

Recipe

Neck and giblets from 1 turkey
6 cups water
1 onion, quartered
1 carrot, cut in pieces
1 celery stalk, cut in pieces
Black peppercorns
Butter, optional
3 tablespoons flour
Salt, pepper

Preparation

1. Remove neck and giblets from bird. Separate liver from other giblets and discard or save for another meal.
2. Place remaining giblets and neck in 2-quart saucepan. Add water, onion, carrot, celery and peppercorns, and bring to boil over high heat. Cover, reduce heat to low, and simmer until tender, about $1\frac{1}{2}$ hours. Strain and reserve broth. Discard neck. Chop giblets, cover, and refrigerate.
3. When turkey is roasted, remove from oven and transfer to platter. Lightly cover with foil and let stand about 20 minutes to allow juices to set before carving.
4. Meanwhile, add 1 cup reserved broth to drippings in roasting pan. Place pan over medium heat and scrape browned particles free from bottom with wooden spoon. Pour mixture into clear measuring cup and let fat rise to top. Skim fat off with

spoon, or use specially designed measuring cup that separates the fat.

5. To make 2 cups gravy, place $\frac{1}{2}$ cup turkey fat in saucepan. (If necessary, add butter to make $\frac{1}{2}$ cup.) Add enough reserved giblet broth to skimmed drippings to make 2 cups.
6. Heat fat over medium heat. Stir in flour and cook, stirring, until bubbly. Remove from heat. Gradually pour in dripping-stock mixture, stirring constantly with wire whisk. Return pan to heat and cook, stirring, until gravy boils and thickens. For thinner gravy, add more broth. Stir in giblets. Season to taste with salt and pepper.
7. 2 cups gravy, each tablespoon: 20 calories; 67 mg sodium; 3 mg cholesterol; 1 gram fat; 1 gram carbohydrates; 1 gram protein; 0.05 gram fiber.

EXERCISES

Sometimes it's necessary to adapt a recipe to reduce or increase the number of servings—depending on the number of guests expected. Do you think you could use your skills to adapt this recipe to produce a different number of servings? Could you calculate the nutritional values for a specific portion size? Try answering questions 1–3 to test your skills.

1. Adapt the recipe given in bold print in Step 3 to make 4 cups gravy.
2. Adapt the recipe given in bold print in Step 5 to make 3 cups gravy.
3. If two tablespoons of gravy were used, what would be the nutritional values?

Math in the Media

New Math in the Media exercises help students make connections between the real world and concepts learned in class. They are based on scenarios from the media and appear at the end of each chapter. Related questions follow that ask students to interpret the information, perform necessary calculations, or provide a rationale for their decisions.

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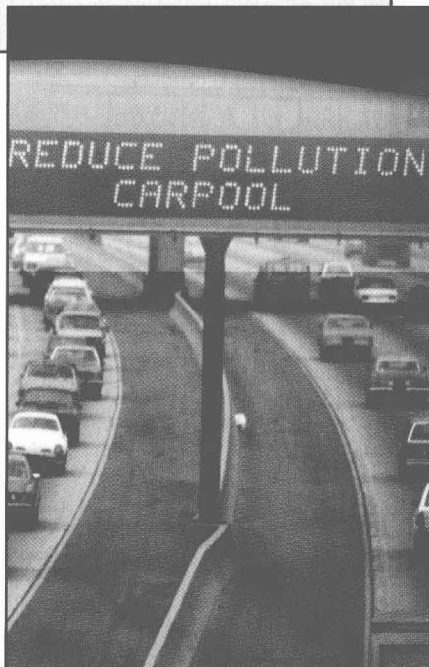
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Chapter

2

Equations and Inequalities

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The Environmental Protection Agency monitors the level of emissions into the air of a number of pollutants. Progress has been made in reducing some pollutants, while others are still at significantly high levels. Could you analyze the level of emissions over the last 50 years and use your math skills to predict the level of emissions in the future? Turn to the Putting Your Skills to Work problems on page 161 to find out.

Chapter-Opening Application

A real-world application opens each chapter and links a specific situation to a Putting Your Skills to Work application that appears in that chapter to enhance students' awareness of the relevance of math.

Integrated Problem Solving

Problem Solving

Problem Solving is thorough and easy to follow; key steps are highlighted with the pedagogical use of color. A clear problem-solving process is defined and reinforced throughout.

Procedure to Solve a Formula for a Specified Variable

1. Remove any parentheses.
2. If fractions exist, multiply all terms on both sides by the LCD of all the fractions.
3. Combine like terms on each side if possible.
4. Add or subtract terms on both sides of the equation to get all terms with the desired variable on one side of the equation.
5. Add or subtract the appropriate quantities to get all terms that do *not* have the desired variable on the other side of the equation.
6. Divide both sides of the equation by the coefficient of the desired variable.
7. Simplify if possible.

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1. *Understand the problem.*
 - (a) Read the word problem carefully to get an overview.
 - (b) Determine what information you will need to solve the problem.
 - (c) Draw a sketch. Label it with the known information. Determine what needs to be found.
 - (d) Choose a variable to represent one unknown quantity.
 - (e) If necessary, represent other unknown quantities in terms of that very same variable.
2. *Write an equation.*
 - (a) Look for key words to help you to translate the words into algebraic symbols and expressions.
 - (b) Use a given relationship in the problem or an appropriate formula to write an equation.
3. *Solve and state the answer.*
4. *Check.*
 - (a) Check the solution in the original equation.
 - (b) Be sure the solution to the equation makes sense in the context of the problem. You may need to do some additional work.

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EXAMPLE 4 The mean annual snowfall in Juneau, Alaska, is 105.8 inches. This is 20.2 inches less than three times the annual snowfall in Boston. What is the annual snowfall in Boston?

Understand the problem and write an equation.

Mathematics Blueprint For Problem Solving

Gather the Facts	Assign the Variable	Basic Formula or Equation	Key Points to Remember
Snowfall in Juneau is 105.8 inches. This is 20.2 inches less than three times the snowfall in Boston.	We do not know the snowfall in Boston. Let b = annual snowfall in Boston. Then $3b - 20.2$ = annual snowfall in Juneau.	Set $3b - 20.2$ equal to 105.8, which is the snowfall in Juneau.	All measurements of snowfall are recorded in inches.

Juneau's snowfall is 20.2 less than three times Boston's snowfall.

$$105.8 = 3b - 20.2$$

Solve and state the answer.

You may want to rewrite the equation to make it easier to solve.

$$3b - 20.2 = 105.8$$

$$3b = 126 \quad \text{Add 20.2 to both sides.}$$

$$b = 42 \quad \text{Divide both sides by 3.}$$

The annual snowfall in Boston is 42 inches.

Check.

Reread the word problem. Work backward.

Three times 42 is 126.

126 less 20.2 is 105.8.

Is this the annual snowfall in Juneau? Yes. ✓

Practice Problem 4 The maximum recorded rainfall for a 24-hour period in the United States occurred in Alvin, Texas, on July 25–26, 1979. This amount was 24 inches more than the maximum recorded rainfall for a 24-hour period in Canada, which occurred in Ucluelet Brynnor Mines, British Columbia, on October 6, 1977. The total rainfall from these two occurrences was 62 inches. How much rainfall was recorded for each location? (Source: National Oceanic and Atmospheric Administration)

Mathematics Blueprint for Problem Solving

Students begin the problem-solving process and plan the steps to be taken along the way using an outline to organize their approach to problem solving. Once students fill in the blueprint, they can refer back to their plan to solve the problem.