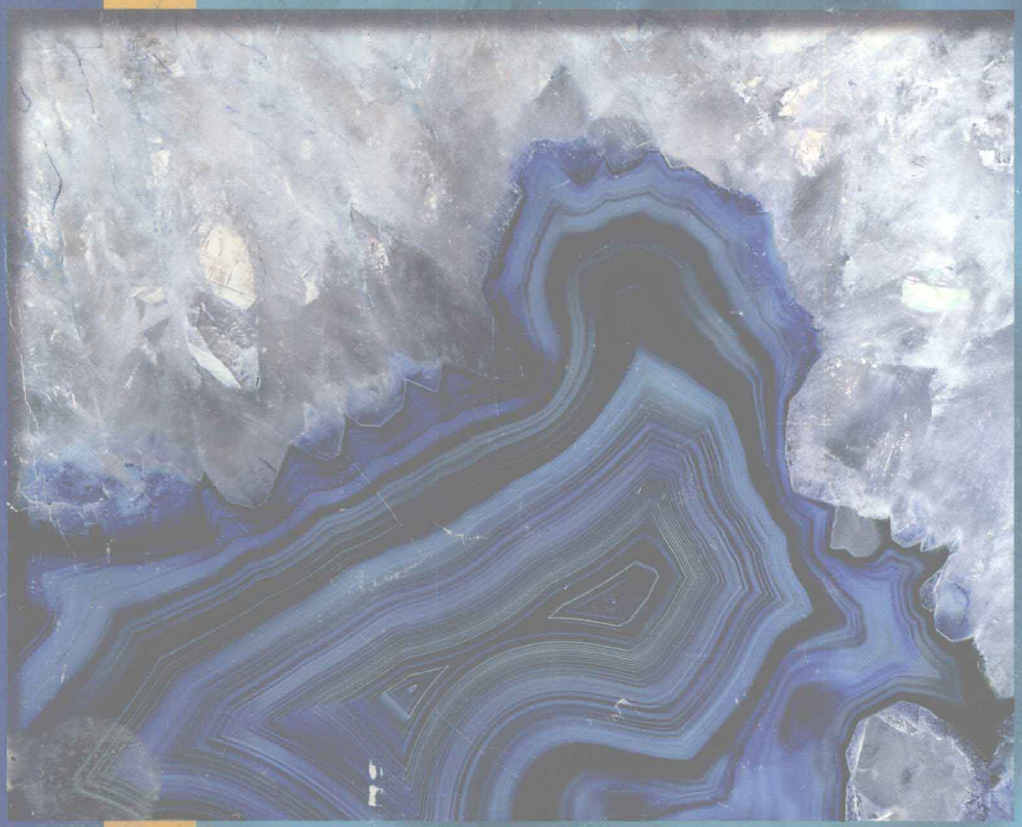
Geoffrey Akst *Sadie Bragg*



BASIC MATHEMATICS

through Applications

Second Edition

Basic Mathematics

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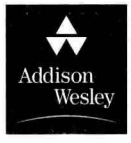
Second Edition

Geoffrey Akst • Sadie Bragg
Borough of Manhattan Community College,
City University of New York



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Preface

From the Authors

Our goal in writing *Basic Mathematics through Applications,* Second Edition was to help motivate students and to establish a strong foundation for their success in a developmental mathematics program. Our text provides the appropriate coverage and review of whole numbers, fractions, decimals, ratio and proportion, percents, signed numbers, a preview of statistics, measurement and units, and an introduction to geometry. Compared to other texts on the market, we have introduced algebra earlier in our text to stress the importance of algebraic concepts and skills and to allow us to adopt an algebraic approach in successive chapters.

For all topics covered in this text, we have carefully selected applications that we believe are relevant, interesting, and motivating. This thoroughly integrated emphasis on applications reflects our view that college students need to master basic mathematics not so much for its own sake but rather to be able to apply this understanding to their everyday lives and to the demands of subsequent college courses.

Our goal throughout the text has been to address many of the issues raised by the American Mathematical Association of Two-Year Colleges and the National Council of Teachers of Mathematics by writing a flexible, approachable, and readable text that reflects

- an emphasis on applications that model real-world situations,
- explanations that foster conceptual understanding,
- exercises with connections to other disciplines,
- appropriate use of technology,
- an emphasis on estimation,
- the integration of geometric visualization with concepts and applications,
- exercises in student writing and groupwork that encourage interactive and collaborative learning, and
- the use of real data in charts, tables, and graphs.

The following key content and key features stem from our strong belief that mathematics is logical, useful, and fun.

Key Content

Applications One of the main reasons to study mathematics is its applications to a wide range of disciplines, to a variety of occupations, and to everyday situations. Each chapter begins with a real-world application to show the usefulness of the topic under discussion and to motivate student interest. These opening applications vary widely from whole numbers in the census to fractions and the stock market crash of 1929, and decimals and blood tests (see pages 1, 79, and 161). When appropriate to the chapter content, applications are highlighted in section exercise sets with an Applications heading (see pages 50, 230, and 279).

Concepts Explanations in each section foster intuition by promoting student understanding of underlying concepts. To stress these concepts, we included discovery-type exercises on reasoning and pattern recognition that encourage students to be logical in their problem-solving techniques, promote self-confidence, and allow students with varying learning styles to be successful (see pages 29, 291, and 321).

Skills Practice is necessary to reinforce and maintain skills. In addition to comprehensive chapter problem sets, chapter review exercises include mixed applications, requiring students to use skills learned in previous sections and chapters (see pages 155, 256, and 333).

Writing Writing both enhances and demonstrates students' understanding of concepts and skills. In addition to the user-friendly worktext format, open-ended questions throughout the text give students the opportunity to explain their answers in full sentences. Students can build on these questions by keeping individual journals. Suggestions for optional journal entries are included only in the Annotated Instructor's Edition (see pages 6, 43, and 203).

Estimation Students need to develop estimation skills to distinguish between reasonable and unreasonable solutions, as well as to check their solutions. The chapters on whole numbers (Chapter 1), fractions (Chapter 2), decimals (Chapter 3), and percents (Chapter 6) cover these skills (see pages 1, 79, 161, and 289).

Use of Geometry Students need to develop their abilities to visualize and compare objects. Throughout this text, students have opportunities to use geometric concepts and drawings to solve problems (see pages 16, 38, and 230). In addition, Chapter 11 is dedicated to geometry topics (see page 489).

Use of Technology Each student should be familiar with a range of problem-solving techniques—mental, paper-and-pencil, and calculator arithmetic—depending on the problem and the student's level of mathematical preparation. This text includes optional calculator inserts (see pages 57, 193, and 311), which provide explanations for calculator techniques. These inserts also feature paired side-by-side examples and practice exercises, as well as a va riety of optional calculator exercises in the section exercise sets that use the power of scientific calculators to perform arithmetic operations (see pages 197, 217, and 285). Both calculator inserts and calculator exercises are indicated by a calculator icon. At the end of the text is an Introduction to Calculators that combines and extends the calculator inserts.

Key Features

Side-by-Side Example/Practice Format A distinctive side-by-side format pairs each numbered example with a corresponding practice exercise, encouraging students to get actively involved in the mathematical content from the start. Examples are immediately followed by solutions so that students can have a ready guide to follow as they work (see pages 5, 135, and 203).

MyMathLab Throughout the text, you will see icons such as

,

, and

, which refer to content in the MyMathLab on-line course that accompanies this text. If your instructor has set up a MyMathLab course, you will be able to view the pages of your textbook on-line and use the icons to launch video clips, animations, and practice exercises. Your text may have come packaged with a MyMathLab starter kit, which contains your login name and password for the on-line course. If you purchased a textbook without this starter kit, you can order the kit from your bookstore using ISBN 0-201-78701-6. Once you have your starter kit, and once your instructor has given you the course ID for your MyMathLab on-line course, you are ready to begin using the on-line textbook and all the multimedia features it contains.

Historical Notes To show how mathematics has evolved over the centuries—in many cultures and throughout the world—each chapter features a compelling historical note that investigates and illustrates the origins of mathematical concepts. Historical notes give students

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further evidence that mathematics grew out of a universal need to find efficient solutions to everyday problems. Diverse topics include the evolution of digit notation, the popularization of decimals, and the ancient practice of using a scale to find an unknown weight (see pages 40, 178, and 227). Each historical note is indicated by an icon.

Mindstretchers For every appropriate section in the text, related investigation, critical thinking, mathematical reasoning, pattern recognition, and writing exercises—along with corresponding groupwork and historical connections—are incorporated into one broad-ranged problem set called a mindstretcher. Mindstretchers target different levels and types of student understanding and can be used for enrichment, homework, or extra credit (see pages 130, 188, and 272). Each mindstretcher is indicated by an icon.

Tips Throughout the text, students find helpful suggestions for understanding certain concepts, skills, or rules, and advice on avoiding common mistakes (see pages 16, 56, and 137).

Pretests and Posttests To promote individualized learning—particularly in a self-paced or lab environment—pretests and posttests help students gauge their level of understanding of chapter topics both at the beginning and at the end of each chapter. The pretests and posttests also allow students to target topics for which they may need to do extra work to achieve mastery. All answers to pretests and posttests are given in the answer section of the Student Edition.

Section Objectives At the beginning of each section, clearly stated learning objectives help students and instructors identify and organize individual competencies covered in the upcoming content.

For Extra Help Several valuable study aids accompany this text. Located along the bottom of the first page of every exercise set are references to the appropriate videotape and CD, the tutorial software, the Addison-Wesley Math Tutor Center, and the *Student's Solutions Manual,* to make it easy for students to find the correct support materials.

Key Concepts and Skills At the end of each chapter, a comprehensive chart organized by section relates the key concepts and skills to a corresponding description and example, giving students a unique tool to help them review and translate the main points of the chapter.

Chapter Review Exercises Following the Key Concepts and Skills at the end of each chapter, a variety of relevant exercises organized by section help students test their comprehension of the chapter content. As mentioned earlier, included in these exercises are mixed applications, which give students an opportunity to practice their reasoning skills by requiring them to choose and apply an appropriate problem-solving method from several previously presented (see pages 256, 285, and 333).

Cumulative Review Exercises At the end of Chapter 2 and for every chapter thereafter, Cumulative Review Exercises help students maintain and build on the skills learned in previous chapters.

Supplements for the Student

Student's Solutions Manual (ISBN 0-201-88282-5)
This useful manual contains solutions to all odd-numbered exercises in each exercise set and solutions to all chapter pretests and posttests, practice exercises, review exercises, and cumulative review exercises.

Videotapes (ISBN 0-201-88289-2)
This new video series includes a section-by-section correlation with many odd-numbered exercises taken from the corresponding text exercise set. Each video segment includes a stop-tape feature that encourages students to stop the tape, work an example, and resume playing the tape to go over the solution with the video instructor.

Digital Video Tutor (ISBN 0-321-11565-1)
Addison-Wesley mathematics videos are available on CD-ROM, making it easy and convenient for students to watch video segments from a computer either at home or on campus. This complete video set, affordable and portable for student use, is ideal for distance learning or extra instruction.

InterAct Math® Tutorial Software (ISBN 0-201-88288-4)
This tutorial software correlates directly to the odd-numbered exercises in the text. The program is highly interactive, with sample problems and interactive guided solutions accompanying these exercises. The program recognizes common student errors and provides step-by-step customized feedback with sophisticated answer recognition capabilities. The management system (InterAct Math® Plus) allows instructors to create, administer, and track tests, and to monitor student performance during practice sessions.

Addison-Wesley Math Tutor Center
This center is staffed by qualified mathematics instructors who provide students with tutoring on text examples, exercises, and problems. Tutoring is provided by toll-free telephone, fax, and e-mail, and is available five days a week, seven hours a day.

InterAct MathXL: www.mathxl.com (ISBN 0-201-72611-4)
This software helps students prepare for tests by allowing them to take practice tests that are similar to the chapter tests in their text. The software automatically scores their tests and each student gets a personalized study guide that identifies individual student strengths and pinpoints topics that need more review. Links from the study guide take the student directly to the appropriate sections in the InterAct Math tutorial software for more practice and review. Through the course-management feature professors can track student results online.

MyMathLab
MyMathLab is a text-specific, on-line course that provides students with a centralized point of access to the wide variety of multimedia resources that accompany this text. The pages of the textbook are loaded into MyMathLab, and as students work through a section of the on-line text, they can link directly to supplementary resources (such as tutorial software, interactive animations, and audio and video clips) that provide instruction, exploration, and practice beyond what is offered in the printed book. Ideal for lecture-based, lab-based, and distance-learning courses, MyMathLab generates personalized study plans for students and allows instructors to track all student work on tutorials, quizzes, and tests. Complete course-management capabilities, including a host of communication tools for course participants, are provided to create a user-friendly and interactive on-line learning environment.

For more information on these and other helpful supplements published by Addison-Wesley, please contact your bookstore.

Supplements for the Instructor (available free to qualifying adopters)

Annotated Instructor's Edition (ISBN 0-201-79647-3)
The annotated version of the student text includes answers to all exercises printed in blue on the same page as those exercises. Teaching tips in each chapter provide instructors with alternative explanations and approaches, typical student misconceptions, and connections to previous and future topics to consider conveying to their students, including annotations for suggested student journal entries (see pages 7, 83, and 203).

Instructor's Solutions Manual (ISBN 0-201-88280-9)
This manual contains worked-out solutions to every even-numbered text exercise as well as solutions to mindstretcher exercises.

Printed Test Bank/Instructor's Resource Guide (ISBN 0-201-88283-3)
This supplement includes four different versions of chapter tests for every chapter, and two final exams.

TestGen-EQ with QuizMaster-EQ dual-platform CD-ROM (ISBN 0-201-88287-6)
TestGen-EQ has a friendly graphical interface that enables instructors to easily view, edit, and add questions, transfer questions to tests, and print tests in a variety of fonts and forms. Search and sort features let the instructor quickly locate questions and arrange them in a preferred order. Six question formats are available, including short-answer, true/false, multiple-choice, essay, matching, and bi-modal. A built-in question editor gives the user power to create graphs, import graphics, insert mathematical symbols and templates, and insert variable numbers or text. The computerized testbank includes algorithmically defined problems organized according to the textbook. An export to HTML feature lets instructors create practice tests for the Web. QuizMaster-EQ enables instructors to create and save tests by using TestGen-EQ so that students can take them for practice or for a grade on a computer network. Instructors can set preferences for how and when tests are administered. QuizMaster-EQ automatically grades the exams, stores the results on disk, and allows the instructor to view or print a variety of reports for individual students, classes, or courses.

MyMathLab
MyMathLab is a complete, on-line course for Addison-Wesley mathematics textbooks that provides interactive, multimedia instruction correlated to the textbook content. MyMathLab is easily customizable to suit the needs of students and instructors and provides a comprehensive and efficient on-line course-management system that allows for diagnosis, assessment, and tracking of students' progress.

MyMathLab Features:

- Fully interactive multimedia textbooks are built in CourseCompass, a version of Blackboard™ designed specifically for Addison-Wesley.
- Chapter and section folders from the textbook contain a wide range of instructional content, including videos, software tools, audio clips, animations, and electronic supplements.
- Hyperlinks take you directly to on-line testing, diagnosis, tutorials, and gradebooks in MathXL—Addison-Wesley's tutorial and testing system for mathematics and statistics.
- Instructors can create, copy, edit, assign, and track all tests for their course as well as track student tutorial and testing performance.
- With push-button ease, instructors can remove, hide, or annotate Addison-Wesley preloaded content, add their own course documents, or change the order in which material is presented.
- Using the communication tools found in MyMathLab, instructors can hold on-line office hours, host a discussion board, create communication groups within their class, send e-mails, and maintain a course calendar.
- Print supplements are available on-line, side by side with their textbooks.

For more information, visit our Web site at www.mymathlab.com or contact your Addison-Wesley sales representative for a live demonstration.

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We are grateful to everyone who has helped to shape this textbook by responding to questionnaires, participating in telephone surveys and focus groups, reviewing the manuscript, and using the text in their classes. We wish to thank all of you.

Writing a textbook requires the contributions of many individuals. Special thanks go to Greg Tobin, our publisher at Addison-Wesley, for encouraging and supporting us throughout the entire process. We are very grateful to Elka Block, our developmental editor, who assisted us in more ways than one could imagine and whose unwavering support made our work more manageable. We thank Kari Heen for her patience and tact in gently reminding us of deadlines,

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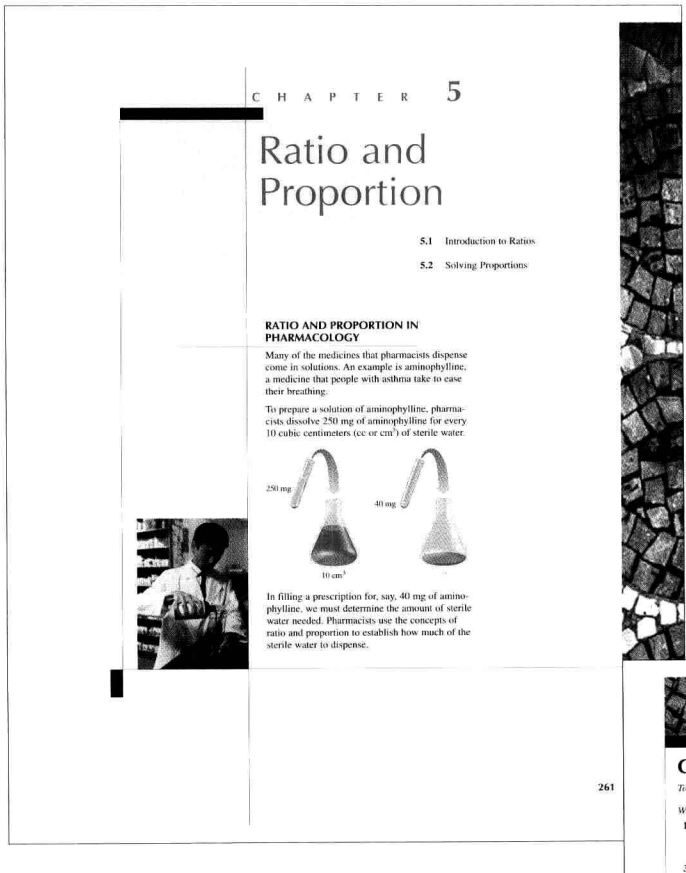
This book is dedicated to our mothers,
Mag Dora Chavis and Anne Akst.

Walk-Through



CHAPTER 5

Ratio and Proportion

5.1 Introduction to Ratios

5.2 Solving Proportions

RATIO AND PROPORTION IN PHARMACOLOGY

Many of the medicines that pharmacists dispense come in solutions. An example is aminophylline, a medicine that people with asthma take to ease their breathing.

To prepare a solution of aminophylline, pharmacists dissolve 250 mg of aminophylline for every 10 cubic centimeters (cc or cm^3) of sterile water.

In filling a prescription for, say, 40 mg of aminophylline, we must determine the amount of sterile water needed. Pharmacists use the concepts of ratio and proportion to establish how much of the sterile water to dispense.

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CHAPTER OPENERS:

The focus of this textbook is applications, and you will find them everywhere—in the chapter openers, in the explanation of the material, in the examples, and in the exercise sets. Each chapter opener introduces students to the material that lies ahead through an interesting and real career application, in an effort to grab students' attention and help them understand the relevance of mathematics to their lives and different careers. (p. 261)

Chapter 5 Pretest

To see if you have already mastered the topics in this chapter, take this test.

Write each ratio or rate in simplest form.

1. 6 to 8

2. 21 to 27

3. $30 to $18

4. 19 feet to 51 feet

5. 12 dental assistants for every 6 dentists

6. 48 gallons of water in 15 minutes

7. 60 baskets in 180 attempts

8. 10 milligrams every 6 hours

9. $690 for 3 boxes of ceramic tiles

10. 15 pages in 75 minutes

Determine whether each proportion is true or false.

11. $\frac{2}{3} \stackrel{?}{=} \frac{16}{24}$

12. $\frac{32}{20} \stackrel{?}{=} \frac{8}{3}$

Solve for x. Then check.

13. $\frac{6}{8} = \frac{x}{12}$

14. $\frac{21}{x} = \frac{2}{3}$

15. $\frac{\frac{1}{2}}{4} = \frac{2}{x}$

16. $\frac{x}{6} = \frac{8}{0.3}$

Solve.

17. A contractor combines 80 lb of sand with 100 lb of gravel. In this mixture, what is the ratio of sand to gravel?

18. At a local bulk laundry shop, you pay $54 to clean 27 lb of laundry. At this rate, how much do you pay per pound?

19. On a college campus, the student to faculty ratio is 35 to 2. How many faculty members should the college have to maintain this ratio for a student body of 3,570?

20. The scale on a map is 3 inches to 31 miles. If two cities are 8.4 inches apart on the map, what is the actual distance, to the nearest mile, between the two cities?

■ *Check your answers on page A-7.*

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PRETESTS:

Pretests, found at the beginning of each chapter, help students to gauge their understanding of the chapter ahead. Answers can be found in the back of the book. (p. 262)

TEACHING TIPS:

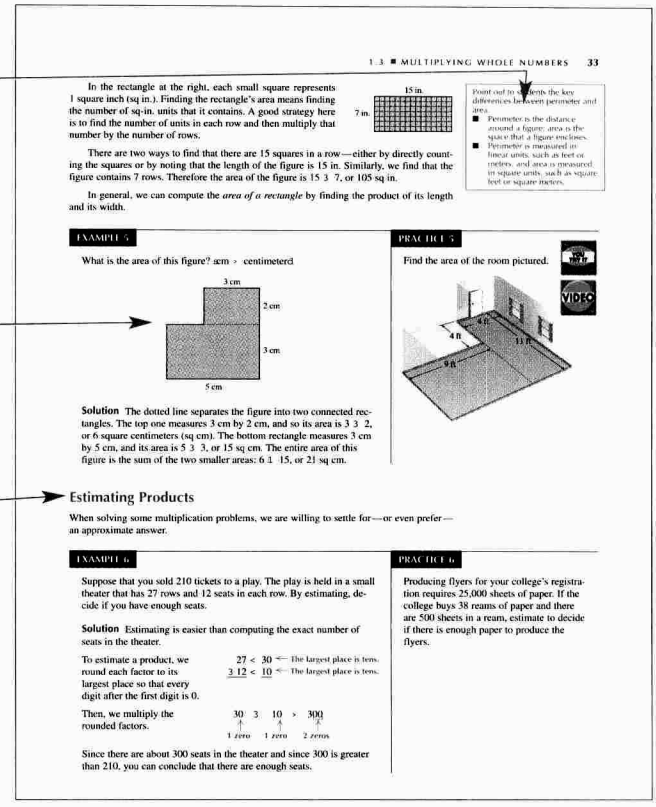
These tips, found only in the Annotated Instructor's Edition, help instructors with explanations, reminders of previously covered material, and tips on encouraging students to write in a journal.

GEOMETRY:

The authors integrate this important topic where appropriate throughout the text so students can see its relevance to their surroundings.

ESTIMATION:

In order to help students develop their reasoning skills, the authors integrate the topic of estimation throughout the text.



1.3 ■ MULTIPLYING WHOLE NUMBERS 33

In the rectangle at the right, each small square represents 1 square inch (sq in.). Finding the rectangle's area means finding the number of sq-in. units that it contains. A good strategy here is to find the number of units in each row and then multiply that number by the number of rows.

15 in.
7 in.

There are two ways to find that there are 15 squares in a row—either by directly counting the squares or by noting that the length of the figure is 15 in. Similarly, we find that the figure contains 7 rows. Therefore the area of the figure is 15 · 7, or 105 sq in.

In general, we can compute the *area of a rectangle* by finding the product of its length and its width.

Point out to students the key differences between perimeter and area.
- Perimeter is the distance around a figure; area is the space that a figure encloses.
- Perimeter is measured in linear units, such as feet or meters, and area is measured in square units, such as square feet or square meters.

EXAMPLE 5

What is the area of this figure? (cm = centimeter)

3 cm, 2 cm, 3 cm, 5 cm

Solution The dotted line separates the figure into two connected rectangles. The top one measures 3 cm by 2 cm, and so its area is 3 · 2, or 6 square centimeters (sq cm). The bottom rectangle measures 3 cm by 5 cm, and its area is 5 · 3, or 15 sq cm. The entire area of this figure is the sum of the two smaller areas: 6 + 15, or 21 sq cm.

PRACTICE 5

Find the area of the room pictured.

4 ft, 4 ft, 11 ft, 9 ft

VIDEO

Estimating Products

When solving some multiplication problems, we are willing to settle for—or even prefer—an approximate answer.

EXAMPLE 6

Suppose that you sold 210 tickets to a play. The play is held in a small theater that has 27 rows and 12 seats in each row. By estimating, decide if you have enough seats.

Solution Estimating is easier than computing the exact number of seats in the theater.

To estimate a product, we round each factor to its largest place so that every digit after the first digit is 0.

$27 < 30$ ← The largest place is tens.
$12 < 10$ ← The largest place is tens.

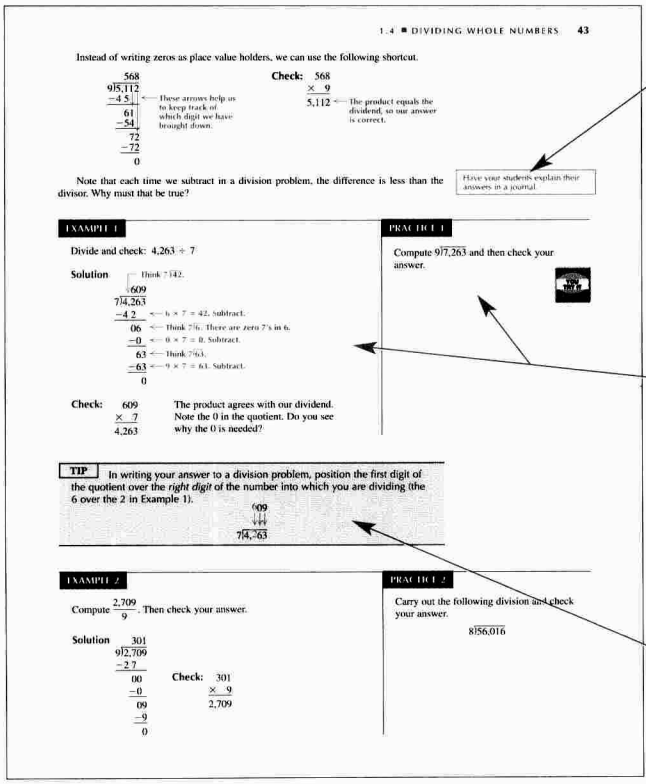
Then, we multiply the rounded factors.

$30 \cdot 10 > 300$
1 zero, 1 zero, 2 zeros

Since there are about 300 seats in the theater and since 300 is greater than 210, you can conclude that there are enough seats.

PRACTICE 6

Producing flyers for your college's registration requires 25,000 sheets of paper. If the college buys 38 reams of paper and there are 500 sheets in a ream, estimate to decide if there is enough paper to produce the flyers.



1.4 ■ DIVIDING WHOLE NUMBERS 43

Instead of writing zeros as place value holders, we can use the following shortcut.

$$\begin{array}{r} 568 \\ 9\overline{)5,112} \\ -45 \\ \hline 61 \\ -54 \\ \hline 72 \\ -72 \\ \hline 0 \end{array}$$

← These arrows help us to keep track of which digit we have brought down.

Check: $568 \times 9 = 5,112$ ← The product equals the dividend, so our answer is correct.

Note that each time we subtract in a division problem, the difference is less than the divisor. Why must that be true?

Have your students explain their answers in a journal.

EXAMPLE 1

Divide and check: $4,263 \div 7$

Solution

$$\begin{array}{r} 609 \\ 7\overline{)4,263} \\ -42 \\ \hline 06 \\ -0 \\ \hline 63 \\ -63 \\ \hline 0 \end{array}$$

← Think 7|42.
← $6 \times 7 = 42$. Subtract.
← Think 7|06. There are zero 7's in 6.
← $0 \times 7 = 0$. Subtract.
← Think 7|63.
← $9 \times 7 = 63$. Subtract.

Check: $609 \times 7 = 4,263$

The product agrees with our dividend. Note the 0 in the quotient. Do you see why the 0 is needed?

PRACTICE 1

Compute $9\overline{)7,263}$ and then check your answer.

WATCH

TIP In writing your answer to a division problem, position the first digit of the quotient over the *right digit* of the number into which you are dividing (the 6 over the 2 in Example 1).

$$\begin{array}{r} 609 \\ 7\overline{)4,263} \end{array}$$

EXAMPLE 2

Compute $\frac{2,709}{9}$. Then check your answer.

Solution

$$\begin{array}{r} 301 \\ 9\overline{)2,709} \\ -27 \\ \hline 00 \\ -0 \\ \hline 09 \\ -9 \\ \hline 0 \end{array}$$

Check: $301 \times 9 = 2,709$

PRACTICE 2

Carry out the following division and check your answer.

$8\overline{)56,016}$

WRITING EXERCISES:

Students understand a concept better if they have to explain it in their own words. Journal assignments (provided in the Teaching Tips) give students an opportunity to improve their mathematical vocabulary and communication skills, thus improving their understanding of mathematical concepts.

SIDE-BY-SIDE FORMAT:

A unique side-by-side format pairs examples with corresponding practice exercises, encouraging active learning from the start. Students use this format for solving skill exercises, application problems, and technology exercises throughout the text.

STUDENT TIPS:

These insightful tips help students avoid common errors and provide other helpful suggestions to foster understanding of the material at hand.

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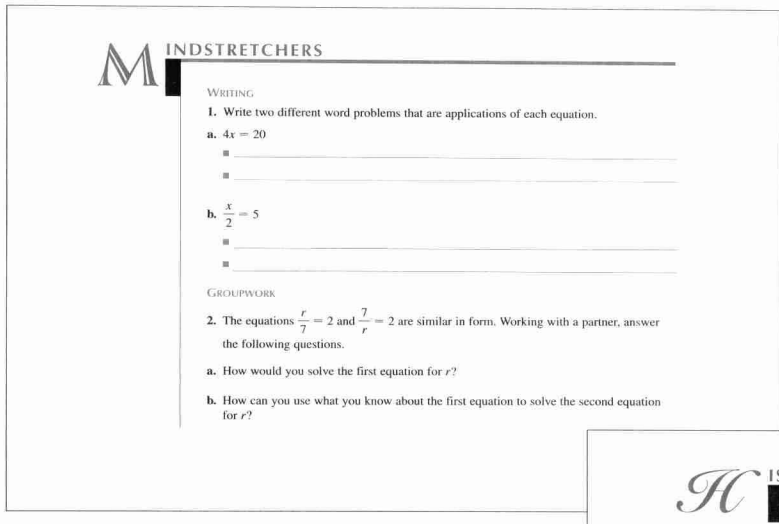


MINDSTRETCHERS

WRITING

1. Write two different word problems that are applications of each equation.

a. $4x = 20$

b. $\frac{x}{2} = 5$

GROUPWORK

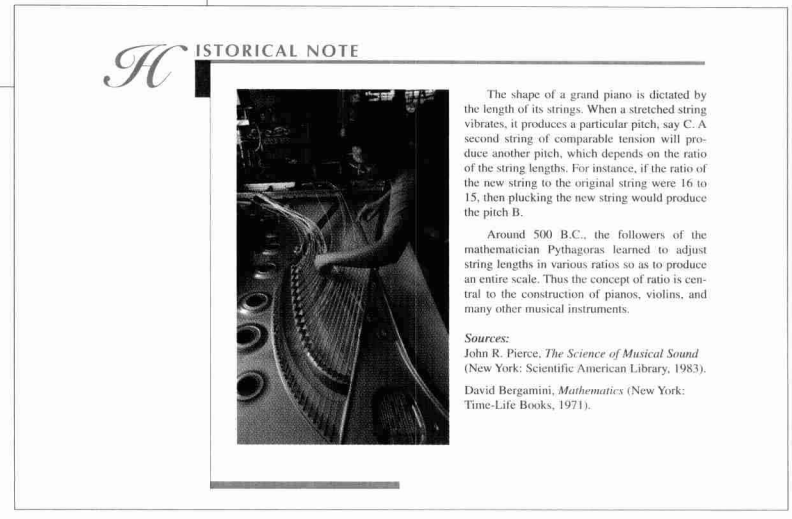
2. The equations $\frac{r}{7} = 2$ and $\frac{7}{r} = 2$ are similar in form. Working with a partner, answer the following questions.

a. How would you solve the first equation for r?

b. How can you use what you know about the first equation to solve the second equation for r?

MINDSTRETCHERS:

At the end of almost every section, students find these engaging activities that incorporate related investigation, critical thinking, mathematical reasoning, pattern recognition, and writing exercises along with corresponding groupwork and historical connections in one comprehensive problem set. These problem sets target different levels and types of student understanding. (p. 252)



HISTORICAL NOTE

The shape of a grand piano is dictated by the length of its strings. When a stretched string vibrates, it produces a particular pitch, say C. A second string of comparable tension will produce another pitch, which depends on the ratio of the string lengths. For instance, if the ratio of the new string to the original string were 16 to 15, then plucking the new string would produce the pitch B.

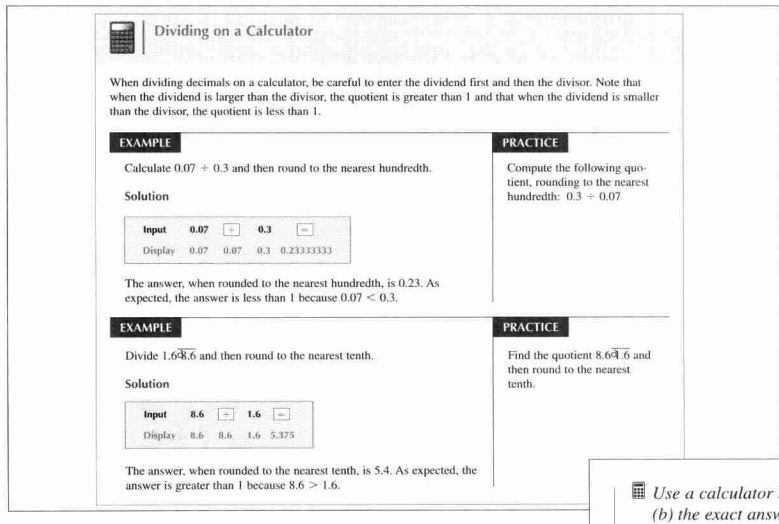
Around 500 B.C., the followers of the mathematician Pythagoras learned to adjust string lengths in various ratios so as to produce an entire scale. Thus the concept of ratio is central to the construction of pianos, violins, and many other musical instruments.

Sources:
John R. Pierce, *The Science of Musical Sound* (New York: Scientific American Library, 1983).

David Bergamini, *Mathematics* (New York: Time-Life Books, 1971).

HISTORICAL NOTES:

In an effort to get students to realize that mathematics was created out of a need to solve problems in everyday life, Historical Notes investigate the origins of mathematical concepts, discussing and illustrating the evolution of mathematics over the centuries, in many cultures, and throughout the world. (p. 267)



Dividing on a Calculator

When dividing decimals on a calculator, be careful to enter the dividend first and then the divisor. Note that when the dividend is larger than the divisor, the quotient is greater than 1 and that when the dividend is smaller than the divisor, the quotient is less than 1.

EXAMPLE

Calculate 0.07 ÷ 0.3 and then round to the nearest hundredth.

Solution

Input	0.07	÷	0.3	=
Display	0.07	0.07	0.3	0.23333333

The answer, when rounded to the nearest hundredth, is 0.23. As expected, the answer is less than 1 because $0.07 < 0.3$.

PRACTICE

Compute the following quotient, rounding to the nearest hundredth: 0.3 ÷ 0.07

EXAMPLE

Divide $1.6\overline{)8.6}$ and then round to the nearest tenth.

Solution

Input	8.6	÷	1.6	=
Display	8.6	8.6	1.6	5.375

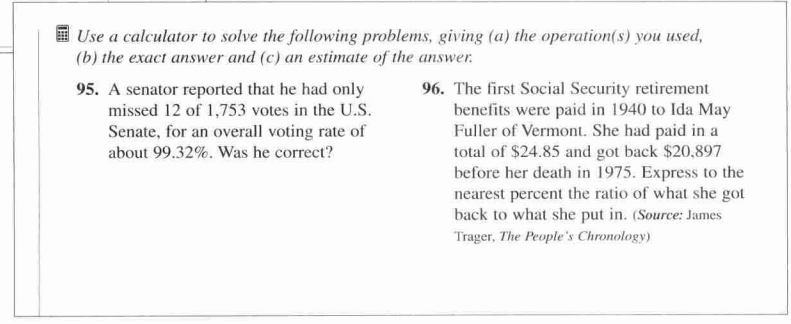
The answer, when rounded to the nearest tenth, is 5.4. As expected, the answer is greater than 1 because $8.6 > 1.6$.

PRACTICE

Find the quotient $8.6\overline{)4.6}$ and then round to the nearest tenth.

TECHNOLOGY INSERTS:

In order to familiarize students with a range of problem-solving methods—mental, paper-and-pencil, and calculator arithmetic—the authors include optional technology inserts that instruct students on how to use the scientific calculator to perform arithmetic operations. Note that even in these inserts, the authors use their side-by-side format to provide consistency in the students' learning environment. (p. 205)



Use a calculator to solve the following problems, giving (a) the operation(s) you used, (b) the exact answer and (c) an estimate of the answer.

95. A senator reported that he had only missed 12 of 1,753 votes in the U.S. Senate, for an overall voting rate of about 99.32%. Was he correct?

96. The first Social Security retirement benefits were paid in 1940 to Ida May Fuller of Vermont. She had paid in a total of $24.85 and got back $20,897 before her death in 1975. Express to the nearest percent the ratio of what she got back to what she put in. (*Source:* James Trager, *The People's Chronology*)

CALCULATOR EXERCISES:

These optional exercises can be found in the exercise sets, giving students the opportunity to use a calculator to solve a variety of real-life applications. (p. 301)

For Extra Help

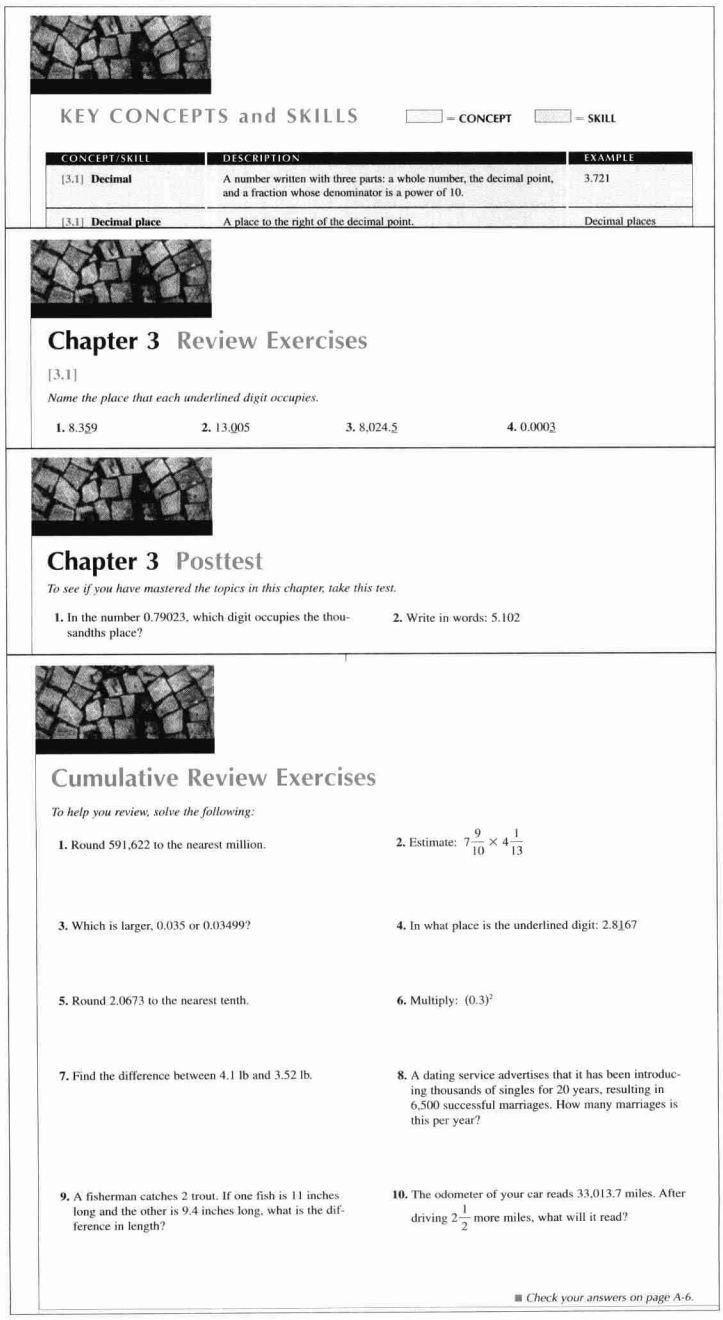
Tape 1 CD 8 | InterAct Math Tutorial Software | AW Math Tutor Center | Student's Solutions Manual

For Extra Help:

These boxes, found along the bottom of the first page of each exercise set, direct students to helpful resources to aid in their study of the material.

End-of-Chapter Material:

In order to reinforce the concepts presented in current and previous chapters, the authors provide a wealth of end-of-chapter material designed to help students retain the concepts they have learned.



KEY CONCEPTS and SKILLS — = CONCEPT — = SKILL

CONCEPT/SKILL	DESCRIPTION	EXAMPLE
[3.1] **Decimal**	A number written with three parts: a whole number, the decimal point, and a fraction whose denominator is a power of 10.	3.721
[3.1] **Decimal place**	A place to the right of the decimal point.	Decimal places

Chapter 3 Review Exercises

[3.1]

Name the place that each underlined digit occupies.

1. 8.3$\underline{5}$9 **2.** 13.$\underline{0}$05 **3.** 8,0$\underline{2}$4.5 **4.** 0.000$\underline{3}$

Chapter 3 Posttest

To see if you have mastered the topics in this chapter, take this test.

1. In the number 0.79023, which digit occupies the thousandths place?

2. Write in words: 5.102

Cumulative Review Exercises

To help you review, solve the following:

1. Round 591,622 to the nearest million.

2. Estimate: $7\frac{9}{10} \times 4\frac{1}{13}$

3. Which is larger, 0.035 or 0.03499?

4. In what place is the underlined digit: 2.8$\underline{1}$67

5. Round 2.0673 to the nearest tenth.

6. Multiply: $(0.3)^2$

7. Find the difference between 4.1 lb and 3.52 lb.

8. A dating service advertises that it has been introducing thousands of singles for 20 years, resulting in 6,500 successful marriages. How many marriages is this per year?

9. A fisherman catches 2 trout. If one fish is 11 inches long and the other is 9.4 inches long, what is the difference in length?

10. The odometer of your car reads 33,013.7 miles. After driving $2\frac{1}{2}$ more miles, what will it read?

■ *Check your answers on page A-6.*

Key Concepts and Skills:

These give students a quick overview of what they have learned in the chapter. Each concept/skill is keyed to the section in which it was introduced, and a brief description and example are provided for a one-stop quick review of the chapter material.

Chapter Review Exercises:

These exercises are keyed to the corresponding sections for easy student reference. Numerous mixed application problems complete each of these exercise sets, always keeping the focus on the applicability of what students are learning.

Chapter Posttest:

Just as every chapter begins with a Pretest to test student understanding BEFORE attempting the material, every chapter ends with a Posttest to measure student understanding AFTER completing the chapter material. Answers to these tests are provided in the back of the book.

Cumulative Review Exercises:

Beginning at the end of Chapter 2, students have the opportunity to maintain their skills by completing the Cumulative Review Exercises. These exercises are invaluable, especially when students need to recall a previously learned concept or skill before beginning the next chapter, or when studying for mid-term and final examinations.

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CHAPTER 1

Whole Numbers

1.1 Introduction to Whole Numbers

1.2 Adding and Subtracting Whole Numbers

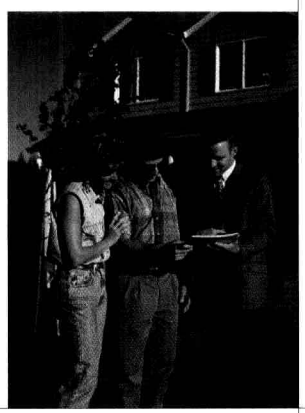
1.3 Multiplying Whole Numbers

1.4 Dividing Whole Numbers

1.5 Exponents, Order of Operations, and Averages

1.6 More on Solving Word Problems

WHOLE NUMBERS IN THE CENSUS



Every ten years, the U.S. Bureau of the Census attempts to count and gather information about each man, woman, and child in the nation. The government then uses this information both to reapportion the 435 seats in the House of Representatives and reallocate billions of dollars in federal funds.

The census also paints a picture of the nation, showing how it has changed since the last count. For example, in the 50 years that elapsed between the 1940 and the 1990 census, the population almost doubled, growing from 131 million to 250 million. The number of telephones more than tripled, increasing from 41 million to 151 million, and the number of divorces quadrupled, swelling from 250 thousand to about a million.

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