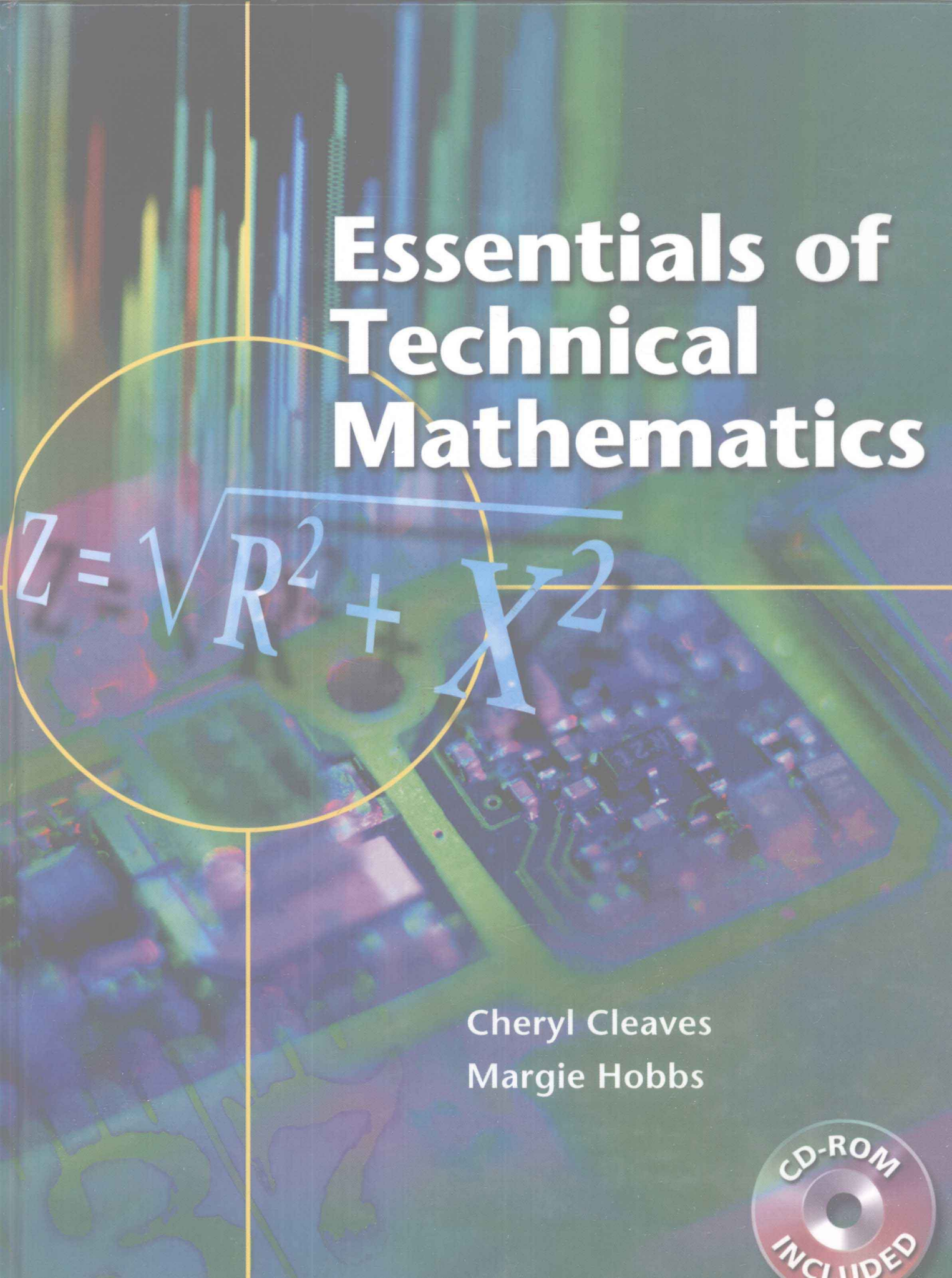
Essentials of Technical Mathematics
$Z = \sqrt{R^2 + X^2}$
Cheryl Cleaves
Margie Hobbs
CD-ROM INCLUDED

Essentials of Technical Mathematics

CHERYL CLEAVES
Southwest Tennessee Community College
MARGIE HOBBS
The University of Mississippi

Upper Saddle River, New Jersey
Columbus, Ohio

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Preface

To the Student

The mathematics you learn in this book will be helpful in your career. We have given much thought to the best way to teach mathematics and have done extensive research on how students learn. We suggest that you use the special features we have included in the text and supplementary materials to get the most from this book and your course. The following features are designed to help you learn the mathematics in this text.

Learning Outcomes. The chapter opening pages list the learning outcomes for the chapter. Each section begins with its particular learning outcomes to show you what you will learn in that section. If you read and think about these outcomes before you begin the section, you will know what to look for as you work through the section.

Good Decisions through Teamwork. Each chapter opens with a class project designed to promote teamwork. The projects incorporate a wide variety of team-building strategies. Each project engages your skills in a unique way—your computational skills, interpersonal skills, oral and written communication skills, organizational skills, research skills, critical-thinking and/or decision-making skills—skills that are highly valued by employers. You will prepare and present project reports for a variety of audiences, including instructors, peers, employers, and immediate supervisors.

Your instructor may use some or all of the projects, or he or she may organize teams within the class and have each team select a project from a different chapter. Even if a particular project is not used in your class, reading the projects will broaden your perception of the usefulness of mathematics.

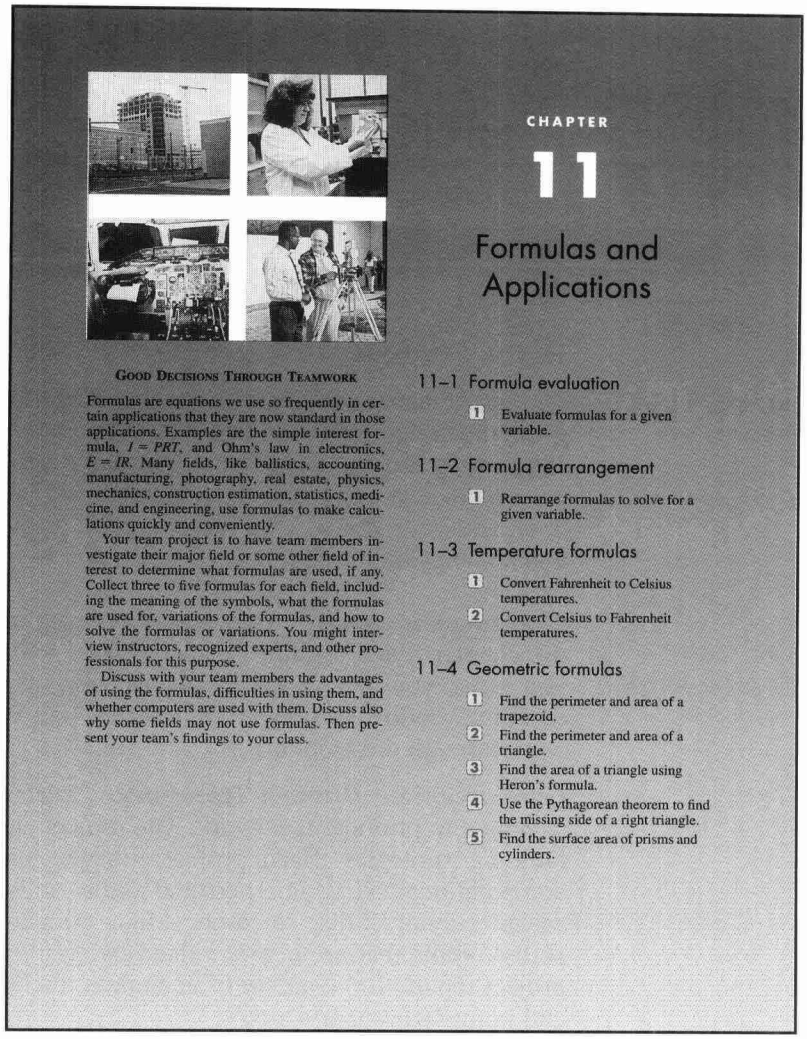
Six-Step Approach to Problem Solving. This approach gives you a system for solving a variety of math problems. You will learn how to organize the information given and how to develop a plan for solving the problem. You are asked to analyze and compare and also to estimate as you solve problems. Estimation helps you decide whether your answer is reasonable. You will learn to interpret the results of your calculations within the context of the problem, a skill you will use on your job.

Use of Color in the Text. As you read the text and work through the examples notice the items shaded with color or with gray. These will help you follow the logic of working through the example. Color also highlights important items and boxed features such as the Tips!, Learning Strategies, and rules, procedures, and formulas.

Tip! Boxes. These boxes give helpful hints and calculator strategies for doing mathematics, and they draw your attention to important generalizations or restrictions that you might otherwise overlook. Many of our students tell us that the tip boxes seem to anticipate and answer many of the questions they have when studying alone.

Good Decisions Through Teamwork

Learning Outcomes



CHAPTER

11

Formulas and Applications

GOOD DECISIONS THROUGH TEAMWORK

Formulas are equations we use so frequently in certain applications that they are now standard in those applications. Examples are the simple interest formula, $I = PRT$, and Ohm's law in electronics, $E = IR$. Many fields, like ballistics, accounting, manufacturing, photography, real estate, physics, mechanics, construction estimation, statistics, medicine, and engineering, use formulas to make calculations quickly and conveniently.

Your team project is to have team members investigate their major field or some other field of interest to determine what formulas are used, if any. Collect three to five formulas for each field, including the meaning of the symbols, what the formulas are used for, variations of the formulas, and how to solve the formulas or variations. You might interview instructors, recognized experts, and other professionals for this purpose.

Discuss with your team members the advantages of using the formulas, difficulties in using them, and whether computers are used with them. Discuss also why some fields may not use formulas. Then present your team's findings to your class.

11–1 Formula evaluation

1. Evaluate formulas for a given variable.

11–2 Formula rearrangement

1. Rearrange formulas to solve for a given variable.

11–3 Temperature formulas

1. Convert Fahrenheit to Celsius temperatures.
2. Convert Celsius to Fahrenheit temperatures.

11–4 Geometric formulas

1. Find the perimeter and area of a trapezoid.
2. Find the perimeter and area of a triangle.
3. Find the area of a triangle using Heron's formula.
4. Use the Pythagorean theorem to find the missing side of a right triangle.
5. Find the surface area of prisms and cylinders.

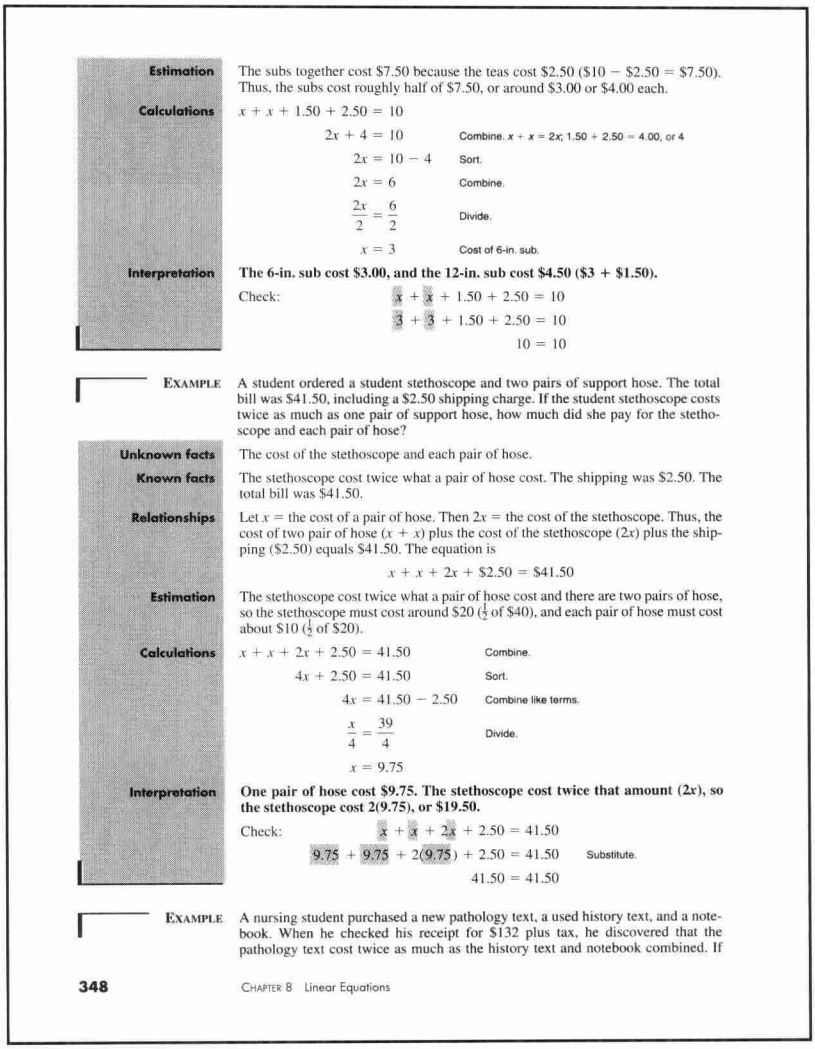
Learning Strategies. In each chapter you will find a number of learning strategies. These strategies can help you build a framework for successful learning. The strategies show ways to manage your learning of mathematics that you may not have thought of before. Use them to improve your "mathematical sense" and to give you a greater appreciation for the power of mathematics in your workplace and everyday life. You may find them useful in other areas of study also.

Using Your Calculator. Calculators are essential in all types of math, and especially in college math for technology. Some of the tips introduce useful and easy-to-follow calculator strategies. The tips show you how to analyze the procedure and set up a problem for a calculator solution; a sample series of keystrokes is often included. In addition, some tips give you strategies so you can determine how your calculator handles various operations.

Self-Study Exercises. These practice sets are keyed to the learning outcomes and appear at the end of each section. Use these exercises to check your understanding of the section. The answers to every problem are at the end of the text so you can get immediate feedback on your level of understanding of the material.

Use of Color in Text

Six-Step Approach to Problem Solving



Estimation The subs together cost \$7.50 because the teas cost \$2.50 (\$10 − \$2.50 = \$7.50). Thus, the subs cost roughly half of \$7.50, or around \$3.00 or \$4.00 each.

Calculations

$x + x + 1.50 + 2.50 = 10$

$2x + 4 = 10$ Combine. $x + x = 2x$; $1.50 + 2.50 = 4.00$, or 4

$2x = 10 - 4$ Sort.

$2x = 6$ Combine.

$\frac{2x}{2} = \frac{6}{2}$ Divide.

$x = 3$ Cost of 6-in. sub.

Interpretation **The 6-in. sub cost \$3.00, and the 12-in. sub cost \$4.50 (\$3 + \$1.50).**

Check: $x + x + 1.50 + 2.50 = 10$

$3 + 3 + 1.50 + 2.50 = 10$

$10 = 10$

EXAMPLE A student ordered a student stethoscope and two pairs of support hose. The total bill was \$41.50, including a \$2.50 shipping charge. If the student stethoscope costs twice as much as one pair of support hose, how much did she pay for the stethoscope and each pair of hose?

Unknown facts The cost of the stethoscope and each pair of hose.

Known facts The stethoscope cost twice what a pair of hose cost. The shipping was \$2.50. The total bill was \$41.50.

Relationships Let x = the cost of a pair of hose. Then $2x$ = the cost of the stethoscope. Thus, the cost of two pair of hose ($x + x$) plus the cost of the stethoscope ($2x$) plus the shipping (\$2.50) equals \$41.50. The equation is

$x + x + 2x + \$2.50 = \$41.50$

Estimation The stethoscope cost twice what a pair of hose cost and there are two pairs of hose, so the stethoscope must cost around \$20 ($\frac{1}{2}$ of \$40), and each pair of hose must cost about \$10 ($\frac{1}{2}$ of \$20).

Calculations

$x + x + 2x + 2.50 = 41.50$ Combine.

$4x + 2.50 = 41.50$ Sort.

$4x = 41.50 - 2.50$ Combine like terms.

$\frac{x}{4} = \frac{39}{4}$ Divide.

$x = 9.75$

Interpretation **One pair of hose cost \$9.75. The stethoscope cost twice that amount ($2x$), so the stethoscope cost 2(9.75), or \$19.50.**

Check: $x + x + 2x + 2.50 = 41.50$

$9.75 + 9.75 + 2(9.75) + 2.50 = 41.50$ Substitute.

$41.50 = 41.50$

EXAMPLE A nursing student purchased a new pathology text, a used history text, and a notebook. When he checked his receipt for \$132 plus tax, he discovered that the pathology text cost twice as much as the history text and notebook combined. If

348 CHAPTER 8 Linear Equations

Career Applications. At the end of most chapters there is a career application. These applications resulted from interviews and research in the workplace, and they demonstrate how widespread math applications are in the workplace and the world around you. They provide opportunities to solve real-world problems, and demonstrate the ways that you regularly use the math concepts you are learning.

Assignment Exercises. An extensive set of exercises appears at the end of each chapter so you can review all the learning outcomes presented in the chapter. You may be assigned these exercises, organized by section, as homework, or you may want to work them on your own for extra practice. Challenge problems are at the end of this set of exercises. The answers to the odd-numbered exercises are given at the end of the book, and worked-out solutions appear in a separate Student Solutions Manual. Your instructor has the solutions to the even-numbered exercises in the Instructor's Resource Manual.

Chapter Trial Test. The trial test at the end of each chapter lets you check your understanding of the chapter concepts. You should be able to work each problem without referring to any examples in your text or your notes. Take this test before you take the class test to evaluate your understanding of the chapter material.

Tip

Tip! *To Add, You . . . Subtract?*

When we add integers, phrases we have used in arithmetic, such as "find the sum" or "add," can be confusing. Yes, in the operation of addition, sometimes we add absolute values and sometimes we subtract absolute values. We often use the word "combine" to imply the addition of numbers with either like or unlike signs.

EXAMPLE Add $-5 + 7$.

$-5 + 7 =$ Signs are unlike.

$-5 + 7 = 2$ Subtract absolute values: $7 - 5 = 2$. Keep the sign of the 7 (positive), the larger absolute value.

Learning Strategy

■ **Learning Strategy** ***Rules and Procedures Are Shortcuts.***

Rules and procedures help us perform operations efficiently, but they don't take the place of understanding the concepts. Let's look again at the problems $7 + (-12)$ and $-5 + 7$, in Figs. 2–24 and 2–25.

Since we move back more spaces than we move forward, we end on the negative side of zero.

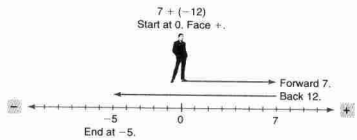


Figure 2–24

Since we move forward more spaces than we move back, we end on the positive side of zero.

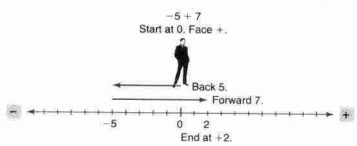


Figure 2–25

- The rule for subtracting absolute values when the numbers have *unlike* signs takes into account that the movements are in opposite directions.
- The rule for giving the sum the sign of the number with the larger absolute value takes into account that the number that creates the largest movement determines whether the sum will be positive or negative.

When an addition involves several positive numbers and several negative numbers, it is convenient to group all the positive numbers and all the negative numbers and to add each group separately. We then add the sums of each group. We can do this because of the associative property of addition. The grouping of addends in an addition does not matter. In the next example we combine the commutative and associative properties of addition to add several signed numbers.

Answers to the odd-numbered problems appear at the end of the book, and their solutions appear in a separate Student Solutions Manual available in your bookstore. Your instructor has the solutions to the even-numbered problems in the Instructor's Resource Manual.

Glossary/Index. An extensive glossary/index makes this book a valuable reference. Use the index to cross-reference topics and to locate other topics that relate to the topic you are studying.

Table of Contents. The table of contents is your "roadmap" to this course. Study it carefully to determine how the topics are arranged. This will aid you in relating topics to each other.

Student Solutions Manual. This manual can be purchased at your bookstore. The manual contains worked-out solutions to the odd-numbered exercises in the Assignment Exercises and the Chapter Trial Test for each chapter of the text. Answers to these exercises appear in the back of your text, but using the manual to study the fully worked-out solutions can enhance your problem-solving skills and your understanding of the concepts covered.

Using Your Calculator

Tip! *Performing a Continuous Sequence of Steps with a Calculator Saves Time.*

Calculations for area and perimeter require one or more operations. To save time, we can perform the calculations in a continuous sequence of steps using a calculator.

Area of a Square

Find the area of a square with 5-in. sides.
Some calculators have a special key or menu option for squaring a number.
Try this option.

$$5\ [x^2] \Rightarrow 25$$

Some calculators use another key to activate the $[x^2]$ key, particularly if the symbol x^2 is written above the x^2 key, $[\ ]$. The key that activates the operations above a key is most often labeled [SHIFT], [2nd], or [INV].

Perimeter of a Rectangle

Find the perimeter of a rectangle that is 10 cm long and 5 cm wide.
Try these options.
Enter the sum first:

$$5\ [+]\ 10\ [=]\ [\times]\ 2\ [=] \Rightarrow 30$$

Use parentheses:

$$2\ [\times]\ [(]\ 5\ [+]\ 10\ [)]\ [=] \Rightarrow 30 \quad \text{With } [\times] \text{ before parentheses.}$$

$$2\ [(]\ 5\ [+]\ 10\ [)]\ [=] \Rightarrow 30 \quad \text{Without } [\times] \text{ before parentheses.}$$

Self-Study Exercises

SELF-STUDY EXERCISES 6–1

1

1. Find the perimeter and the area of Fig. 6–15.

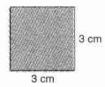


Figure 6–15

2. Name the shape in Fig. 6–15.

Solve these problems involving perimeter and area.

3. Madison Duke is wallpapering a laundry room 8 ft by 8 ft by 8 ft high. How many square feet of paper will she need if there are 63 ft^2 of openings in the room?

4. The square parking lot of a doctor's office is to have curbs built on all four sides. If the lot is 150 ft on each side, how many feet of curb are needed? Allow 10 ft for a driveway into the parking lot.

5. Making no allowances for bases, the pitcher's mound, or the home plate area, calculate how many square yards of artificial turf are needed to resurface an infield at an indoor baseball stadium. The infield is 90 ft on each side. ($9\ ft^2 = 1\ yd^2$.)

6. Ted Davis is a farmer who wants to apply fertilizer to a 40-acre field with dimensions $\frac{1}{4}$ mi $\times$ $\frac{1}{4}$ mi. Find the area in square miles.

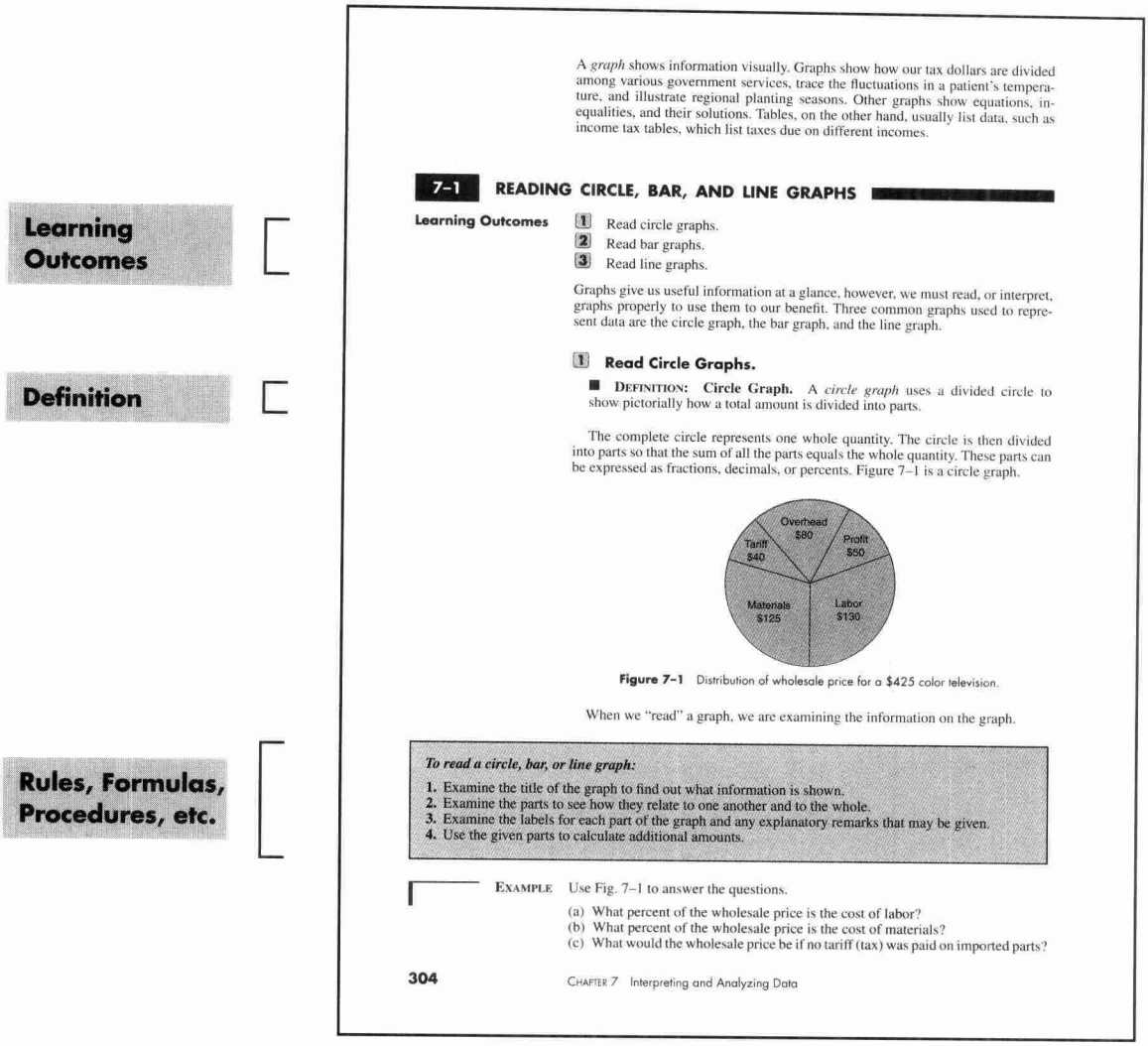
7. If $\frac{1}{4}$ mi is 1,320 ft, how many feet of fencing are needed to enclose the field in Exercise 6, assuming that a 12-ft steel gate will be installed?

8. A 36-in. $\times$ 36-in. ceramic tile shower stall is being installed. How many 4-in. $\times$ 4-in. tiles are needed to cover the floor? Disregard the drain opening and grout spaces.

How to Study Technical Mathematics. Your instructor can get free copies of this booklet, which describes various learning techniques you can use in class and to prepare for class that can make your learning of mathematics much more efficient and effective.

StudyWizard Software. This software, which is packaged with the text, provides additional practice with the math concepts presented in the text. Each question contains a reference to the section and learning outcome number in the text where the concept first appears, making it easier to find the sections you want to review. Immediate feedback is provided to all questions, allowing you to strengthen your skills and test your knowledge of the concepts before a class test. The glossary included on the software allows you to review the terms and concepts presented in the text.

Companion Web Site. This free web site, available at www.prenhall.com/cleaves, provides even more practice with the math concepts presented in the form of short quizzes for each section of the text. These quizzes are immediately graded, and you have the opportunity to send the results to your instructor via e-mail.



We wish you much success in your study of mathematics. Many of the features in this book were suggested by students such as yourself. If you have suggestions for improving the presentation, please give them to your instructor or e-mail the authors at ccleaves@bellsouth.net or mhobbs@watervalley.net.

Reading Your Math Textbook

In developing an effective study plan it is important to use all your available resources to their maximum advantage. The most accessible of these resources is your textbook. Incorporate an effective strategy for reading your textbook into your study plan.

Beginning a Chapter

1. Examine the chapter opening page or pages. Read the chapter title, section titles, and learning outcomes to determine what will be covered in the chapter.
2. Use the learning outcomes as a checklist to rate your initial knowledge of the topics presented in the chapter. This rating can be a numerical one. For example, 0 means you know nothing about this topic, 1 means you know a little but not much about this topic, 2 means you know quite a bit but there may be a few gaps, and 3 means you know this topic very well.

Career Application

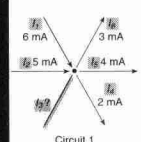
22. The formula for electrical power is $V = \frac{W}{A}$: voltage (V) equals wattage (W) divided by amperage (A). Find the voltage to the nearest hundredth needed for a circuit of 500 W with a current of 3.2 A.
23. Find the interest paid on a loan of \$2,400 for 1 year at an interest rate of 11%.
24. Find the interest paid on a loan of \$800 at $8\frac{1}{2}$% interest for 2 years.
25. Find the total amount of money (maturity value) that the borrower will pay back on a loan of \$1,400 at $12\frac{1}{2}$% simple interest for 3 years.
26. Find the rate of interest on an investment of \$2,500 made by Nurse Honda for a period of 2 years if she received \$612.50 in interest.
27. Maddy Brown needed start-up money for her landscape service. She borrowed \$12,000 for 30 months and paid \$360 interest on the loan. What interest rate did she pay?
28. Raul Fletes needs money to buy lawn equipment. He borrows \$500 for 7 months and pays \$53.96 in interest. What is his rate of interest?
29. Linda Davis agrees to lend money to Alex Luciano at a special interest rate of 9%, on the condition that he borrow enough that he will pay her \$500 in interest over a 2-year period. What is the minimum amount Alex can borrow?
30. Rob Thweatt needs money for medical school. He borrows \$6,000 at 12% interest. If he pays \$360 interest, what is the duration of the loan?

CAREER APPLICATION

Electronics: Kirchhoff's Laws

Kirchhoff's current law (KCL) and Kirchhoff's voltage law (KVL) form the basis of all electronics. The only difficult thing about the two laws is spelling Kirchhoff—notice that there are two h's and two f's. The rest is easy.

Kirchhoff's current law (KCL) says that *the sum of all currents at a node equals zero.* A node is like an intersection near your house. At 3 A.M. there are no cars in the intersection. If each entering car counts +1, and each exiting car counts −1, then the sum of all the cars will equal zero. KCL works the same way, only with current, which is measured in amperes (A). Because an ampere is a large measuring unit, measurements are often in milliamperes (mA), or thousandths of an ampere. Figure 8–8 illustrates a node.



Circuit 1

Figure 8–8

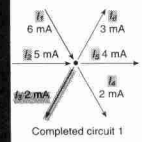
Arrows are often used to indicate current. *Let each entering arrow have a + sign and each exiting arrow have a − sign.* Assume that there is a node with two currents entering the node (I_1 = 6 mA, I_2 = 5 mA), an unknown current I_3, and three currents exiting the node (I_4 = 2 mA, I_5 = 4 mA, and I_6 = 3 mA). See Fig. 8–8, circuit 1. As an equation this is

$$I_1 + I_2 + I_3 + I_4 + I_5 + I_6 = 0$$

$$6\text{ mA} + 5\text{ mA} + I_3 - 2\text{ mA} - 4\text{ mA} - 3\text{ mA} = 0 \quad \text{Insert appropriate numbers and signs.}$$

$$I_3 = 0 - 6\text{ mA} - 5\text{ mA} + 2\text{ mA} + 4\text{ mA} + 3\text{ mA} \quad \text{Solve for } I_3.$$

$$I_3 = -2\text{ mA} \quad \text{Combine like terms.}$$



Completed circuit 1

Figure 8–9

This means that I_3 *is exiting the node and equals 2 mA,* as shown in Fig. 8–9. To verify this, substitute −2 mA into the original equation.

$$I_1 + I_2 + I_3 + I_4 + I_5 + I_6 = 0$$

$$6\text{ mA} + 5\text{ mA} - 2\text{ mA} - 2\text{ mA} - 4\text{ mA} - 3\text{ mA} = 0 \quad \text{It works!}$$

Kirchhoff's voltage law (KVL) says that *the sum of all voltages in any loop equals zero.* Picture a bug walking around any loop in a circuit. Voltage is always measured as a drop in potential across something, so there is a plus sign at one end

Another possible rating strategy can be a minus, check, plus system. Minus means you need to work on this topic, check means you know the topic moderately well, and plus means you know the topic very well.

Beginning a Section

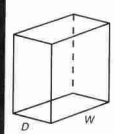
1. Read the section title and the learning outcomes for the section.
2. Read the introductory paragraph.
3. Locate the Self-Study Exercises at the end of the section. Read the directions for each "clump" of exercises. This will give you an idea of the type of problems you will be working and what to look for as you read the section.
4. Begin reading the section. Make notes on concepts that you do not understand or examples for which you are not able to follow the explanation. This will be the basis for questions to ask in class.

Continuing through the Chapter

1. Work on one learning outcome at a time. After reading and studying one learning outcome, try some of the exercises for that outcome. Always check your answers with the text or StudyWizard and ask questions as appropriate. Assess your understanding of each outcome and practice or get help as you think necessary. Be realistic with your self-assessment!

5. If a support has a depth three-fourths the size of the width, find its dimensions and volume.
6. This freeway will be in an earthquake fault zone, so state civil engineers decide to make the depth equal to the width of the support to withstand maximum vibration stress. Find the dimensions and volume of each support.
7. Why do the dimensions you found in Exercise 4 have a volume of exactly 200 ft^3, while the dimensions you found in Exercises 5 and 6 have volumes over and under the prescribed 200 ft^3?
8. A recent computer modeling simulation found that supports with the smallest cross-sectional perimeter per volume are best able to endure vibration stress, which means that supports in earthquake zones should be in the shape of a cylinder (a cylinder has a circular cross-sectional perimeter). Use $V = \pi r^2 h$ to find the radius of the support with a height of 16 ft and a volume of 200 ft^3.
9. Find the cross-sectional perimeters of the supports designed in Exercises 4, 5, 6, and 8. Does the circular cross section have the smallest perimeter?

Answers



1. Support diagram:
2. At 12.5 ft^3 per ft of height, 200 ft^3 is allotted.
3. $D = (\frac{1}{2})W$ or $D = \frac{W}{2}$ or $D = 0.5W$.
4. The width should be 5.0 ft and the depth 2.5 ft, with a volume of 200.0 ft^3.
5. From the equation $16(0.75W)(W) = 200$, the width should be 4.1 ft, the depth should be 3.1 ft, and the height should be 16 ft. These dimensions have a volume of 203.4 ft^3.
6. With $D = W$, both the width and depth should be 3.5 ft, and the height should be 16 ft. These dimensions have a volume of 200.5 ft^3.
7. When the pure quadratic equation of Exercise 4 was solved by the square-root method, an exact square root was found. In Exercises 5 and 6, square roots were approximated to the nearest tenth of a foot, which resulted in round-off error propagation in the volume formula.
8. The radius should be 2.0 ft, which produces a volume of 201.1 ft^3.
9. The perimeter of the rectangular cross section is 15 ft in Exercise 4 and 14.4 ft in Exercise 5. The square cross section of Exercise 6 is 14.2 ft, while the perimeter of the circular cross section of Exercise 8 is 12.6 ft. The perimeter of the circular cross section has the smallest perimeter per volume.

Assignment Exercises

ASSIGNMENT EXERCISES

Section 13–1

Identify the quadratic equations as pure, incomplete, or complete.

1. $x^2 = 49$	**2.** $x^2 - 5x = 0$	**3.** $5x^2 - 45 = 0$
4. $3x^2 + 2x - 1 = 0$	**5.** $8x^2 + 6x = 0$	**6.** $5x^2 + 2x + 1 = 0$
7. $x^2 - 32 = 0$	**8.** $x^2 + x = 0$	**9.** $3x^2 + 6x + 1 = 0$

Section 13–2

Indicate the values for a, b, and c in the quadratic equations.

10. $5x^2 + x + 6 = 0$	**11.** $x^2 - 2x = 8$	**12.** $x^2 - 7x + 12 = 0$
13. $x^2 + 3x = 4$	**14.** $3x^2 = 2x + 7$	**15.** $x^2 - 3x = -2$

Solve the quadratic equations by using the quadratic formula.

16. $x^2 - 9x + 20 = 0$	**17.** $x^2 - 8x - 9 = 0$	**18.** $x^2 - 5x = -6$
19. $x^2 + 2x = 8$	**20.** $x^2 - x - 12 = 0$	**21.** $2x^2 - 3x - 2 = 0$

Assignment Exercises **527**

2. Continue outcome by outcome, section by section, checking your understanding as you go.

Reviewing the Chapter

1. After finishing a chapter, thumb through the entire chapter, reading the Tip! boxes and Learning Strategies.
2. Look through the chapter again, this time reviewing new terminology. New terminology will appear in *italic* type or be set apart as a definition. Read the definitions and make a list of words that may need further review.
3. Read again the learning outcomes on the chapter opening pages and again rate your understanding of each outcome.
4. Work the Chapter Trial Test at the end of the chapter and check your answers. Review or get assistance as necessary.

Finishing the Chapter

1. Prepare for the test on the chapter. Ask your instructor which outcomes require mastery for testing purposes. Some outcomes may not require mastery, and others may even be optional.
2. Read the special features Good Decisions Through Teamwork, Mathematics in the Workplace, and Career Applications to gain some insight about where these concepts are used in real life.

Challenge Problems

Chapter Trial Test

45. Find AB if $\triangle DEC \sim \triangle AEB$ (see Fig. 9–17).

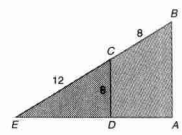


Figure 9–17

CHALLENGE PROBLEMS

46. Make up a word problem that can be solved with a direct proportion. Include a lawn mower, tanks of gasoline, and acres to be mowed.
47. A gear turning at 130 rpm has 50 teeth. It is in mesh with another gear that turns at 65 rpm. How many teeth does the other gear have?
48. Make up a word problem that can be solved with an inverse proportion. Include a belt, pulleys, rpm's, and diameters of the pulleys.
49. The ratio of water to antifreeze in a mixture of radiator solution is 2 to 5. If the radiator is filled with 10 gal of liquid, how much is water and how much is antifreeze?

CHAPTER TRIAL TEST

1. Select two fractions that are proportional from $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}$, and $\frac{6}{8}$.

Solve the equations.

2. $\frac{R}{7} = \frac{2}{5}$
3. $\frac{3+Q}{1} = \frac{4}{5}$
4. $\frac{3}{y+2} = \frac{2}{3}$
5. $\frac{8}{y+2} = -7$
6. $\frac{1}{x} = \frac{7}{6}$

Solve the equations. Round to hundredths when necessary.

7. $\frac{1.2}{x} = 4.05$
8. $\frac{3.8}{6} = \frac{0.05}{R}$
9. A 9-in. gear is in mesh with a 4-in. gear. If the larger gear makes 75 rpm, how many revolutions per minute does the smaller gear make in this inverse relationship?
10. If three workers take 8 days to complete a job, how many workers would be needed to finish the same job in only 6 days if each worked at the same rate? (More workers take fewer days.)
11. If a compact car used 62.5 L of unleaded gasoline to travel 400 mi, how many liters of gasoline would the driver use to travel 350 mi? Round to tenths.
12. The ratio of men to women in technical and trade occupations is estimated to be 3 to 1, that is, $\frac{3}{1}$. If 56,250 men are employed in such occupations in a certain city, how many employees are women?
13. If an ice maker produces 75 lb of ice in $3\frac{1}{2}$ hr, how many pounds of ice would it produce in 5 hr? Round to the nearest whole number.
14. Find HI if $\triangle ABC \sim \triangle GHI$ (see Fig. 9–18).

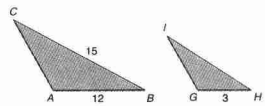


Figure 9–18

General Tips

1. Practice an outcome until you feel comfortable that you understand the concept. Abundant practice material is available to you that is specifically geared to your text (Self-Study Exercises, Assignment Exercises, StudyWizard, and Companion Web Site). Other practice is available through generic mathematics software and other texts. Only you know when you have practiced enough. Be realistic with the self-assessment of your understanding. Practice helps you retain the information for a longer period of time, but don't wear yourself out! Finding that appropriate balance is your goal.
2. Don't forget the Glossary/Index! As you move through the text you will forget definitions and concepts. Maybe you are not starting your study at the beginning of the text and need to review a few concepts that were in the chapters not covered. Examining the Glossary/Index should be your first step in accomplishing your review.

Good luck on your study of mathematics.

To the Instructor

In the development of the text we have tried to address a wide variety of teaching and learning styles and modes of instruction, including on-line course delivery. A holistic approach to student learning is our goal.

We suggest that you encourage your students to read the "To the Student" portion of the preface, having them pay particular attention to the suggestions provided in the section "Reading Your Math Textbook."

Commitment to Improving Mathematics Education. The authors have been and continue to be active in implementing the standards of the American Mathematical Association of Two-Year Colleges (AMATYC), the National Council of Teachers of Mathematics (NCTM), and the Mathematical Association of America (MAA). We enthusiastically promote the standards and guidelines encouraged by these organizations and the SCANS document. The Instructor's Resource Manual gives specific references for implementing the Standards in your courses.

Calculator Usage. Calculator tips that are appropriate for both scientific and graphing calculators are included. These tips are generic (that is, they do not pertain to specific models), and they help students determine how their calculator operates without referring to a user's manual.

We continue to emphasize the calculator as a tool that facilitates learning and understanding, but students' understanding of the mathematical concepts is even more important. To this end, we include assessment strategies throughout the text and supplementary materials that enable students to test their understanding of a concept independently of their calculator.

Study Strategies and Reference Features. In our experiences as instructors, we are keenly aware of the need for students to develop good study habits and good independent learning skills. Students find a good reference text invaluable as they review mathematical concepts when the need arises. We take great pride in our students' praise of the usefulness of this text as a reference standard. For a detailed description of the features of the text and our suggestions for students, refer to the "To the Student" portion of the preface.

Additional Resources. Several additional resources are available with the adoption of the text. These resources include the Instructor's Resource Manual (IRM). This manual includes notes and suggested activities for each chapter along with teaching tips as well as a variety of reproducible activities and worked-out solutions to even-numbered exercises. Also included are a Test Item File and a computerized test item file (PH Test Manager), a Student Solutions Manual, a "How to Study Technical Mathematics" booklet, StudyWizard software (packaged with the text), and a Companion Web site. Contact your Prentice Hall representative for more information.

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Cheryl Cleaves
Margie Hobbs

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