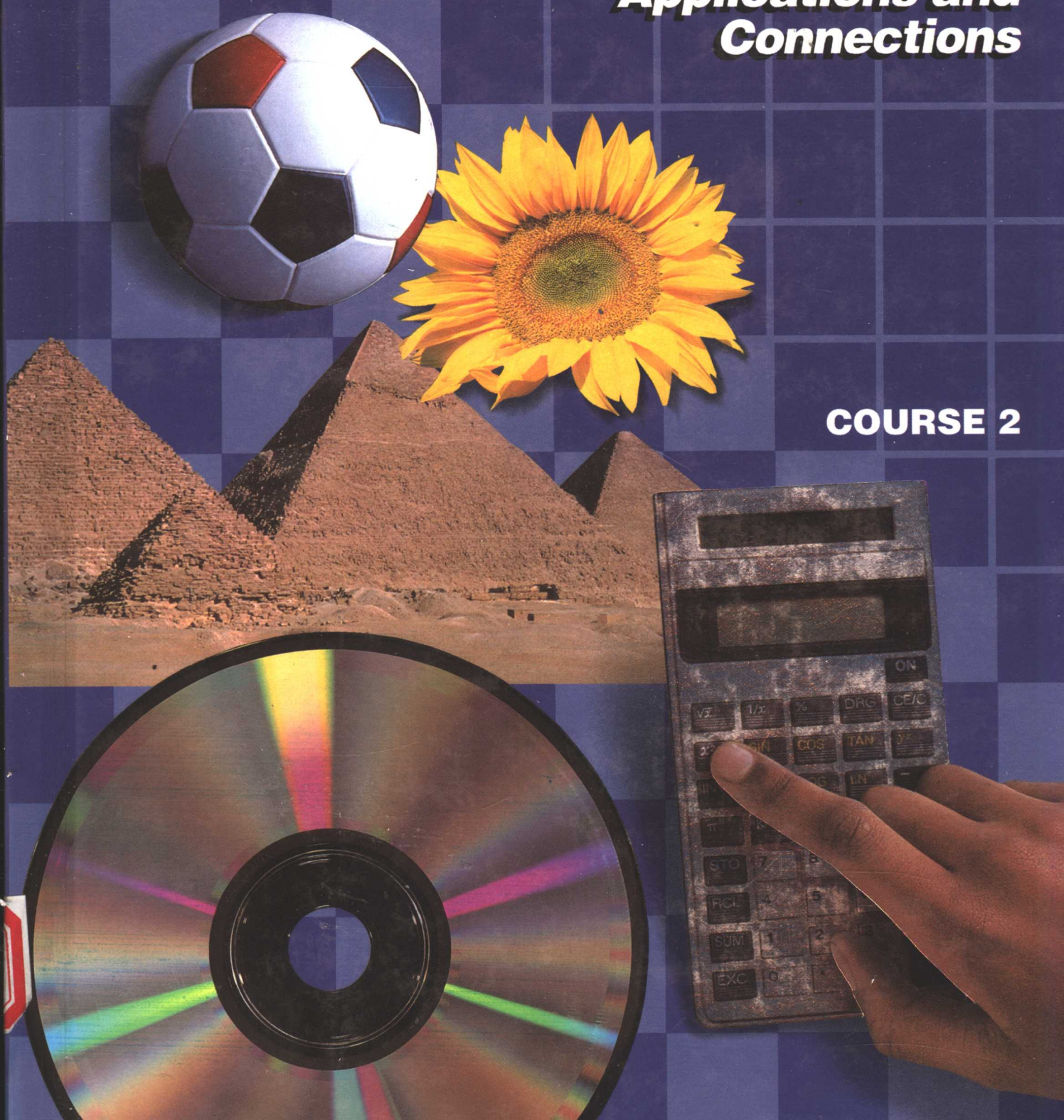
MATHEMATICS

Applications and Connections



COURSE 2

MATHEMATICS

Applications and Connections

COURSE 2

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Letter from the Authors

Dear Students, Teachers, and Parents,

Middle school students are special! That's why we've written the first and only middle school mathematics program in the United States designed specifically for you. The layout of *Mathematics: Applications and Connections* will delight your eyes. And the exciting content will hold your interest and show you why you need to study mathematics every day.

Please look carefully as you page through the text. Right away, you'll notice the variety of ways mathematics content is presented to you. You'll see the many connections made among mathematical topics and note how mathematics naturally fits into other subject areas and with technology.

You will note that content for each lesson is clearly labeled up front. And you'll appreciate the easy-to-follow lesson format. It introduces each new concept with an interesting application followed by clear examples.

Each day, as you read the text and complete the activities, you'll see the practical value of mathematics. You'll quickly grow to appreciate how often mathematics is used in real-world situations that relate directly to your life. If you don't already realize the importance of mathematics in your life, you soon will!

Sincerely, The Authors

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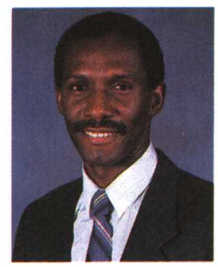

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Previewing Your Text

If you've ever taken an extended trip, you know how important it is to use a map to guide you safely and surely to your destination. Please look upon the following four pages as a map of what you will learn in mathematics this year. Knowing what's ahead will help you make the most of the text's many features, which are designed to make learning math an interesting and valuable experience.

Objectives tell you exactly what you'll learn in each lesson.

Words to Learn lists the new words you'll encounter.

Applications opening nearly every lesson provide you with fascinating information that connects math to the real world and give you a reason to learn math.

A variety of features help to guide you through each lesson.

Solving Multiplication and Division Equations

Objective
Solve equations using the multiplication and division properties of equality.

Words to Learn
division
property of equality
multiplication
property of equality

How can you tell the difference between fraternal twins and identical twins? Fraternal twins do not necessarily look alike. They are not always the same sex, so you can't always tell they are twins. Identical twins look alike and are of the same sex. In the United States, an average of 434 twin babies are born each day. How many sets of twins are born each day?

You know that twins means two. So two times the number of sets of twins is the number of twin babies. If 434 twin babies are born each day, you can solve the equation $434 = 2s$ to find s, the average number of sets of twins born each day.

Since multiplication and division are inverse operations, equations that involve multiplication can be solved by dividing each side of the equation by the same number. Solve $434 = 2s$ using this method.

$434 = 2s$
$\frac{434}{2} = \frac{2s}{2}$ *Divi the*
$217 = s$

Check: $434 = 2s$
$434 \stackrel{?}{=} 2 \cdot$
$434 = 434$

The solution is 21 day in the United

Division Property of Equality

$8 = 8$ $\quad a = b$
$\frac{8}{2} = \frac{8}{2}$ $\quad \frac{a}{c} = \frac{b}{c}, c \neq 0$
$4 = 4$

A margin feature called **Teen Scene** shares interesting, math-related tidbits about teens' lifestyles. Other intriguing margin features are **Did You Know?** and **When Am I Ever Going to Use This?**

Problem Solving gives you the opportunity to use mathematics to find the solution to interesting application problems in marketing and other real-life fields.

Equations that involve division can be solved by multiplying each side of the equation by the same number.

LOOK BACK
You can review fractions on page 190.

Example 1 *Problem Solving*

Marketing Did you know that chewing gum loses its flavor after only about 20 minutes ($\frac{1}{3}$ hour)? However, scientists have recently invented chewing gum that will keep its flavor longer, using synthetically derived polymers. If the newly-developed polymer chewing gum keeps its flavor 30 times as long, use the equation $\frac{1}{3} = \frac{h}{30}$ to find h, the number of hours it keeps its flavor.

$\frac{1}{3} = \frac{h}{30}$
$\frac{1}{3} \cdot 30 = \frac{h}{30} \cdot 30$ *Multiply each side by 30 to undo the division by 30.*
$10 = h$

Check: $\frac{1}{3} = \frac{h}{30}$
$\frac{1}{3} \stackrel{?}{=} \frac{10}{30}$ *Replace h with 10.*
$\frac{1}{3} = \frac{1}{3}$ ✓

The solution is 10. The newly-developed polymer chewing gum may keep its flavor up to 10 hours.

TEEN SCENE
After World War II, various waxes, plastics, and synthetic rubber virtually replaced chicle in making chewing gum. Artificially sweetened chewing gum found a wide market in the U.S. in the late 20th century, with mint being the favorite flavor.

Multiplication Property of Equality

In words: If each side of an equation is multiplied by the same number, then the two sides remain equal.

Arithmetic	Algebra
$4 = 4$	$a = b$
$4 \cdot 2 = 4 \cdot 2$	$ac = bc$
$8 = 8$	

Example 2

Solve $368 = 2.3b$. Check your solution.

$368 = 2.3b$
$\frac{368}{2.3} = \frac{2.3b}{2.3}$
368 ÷ 2
$160 =$

Check: 3
3
3

The solut

Estimation Hint
In Example 2, think $360 \div 2 = 180$. The solution is about 180.

Estimation Hints provide clues about when it's best to solve problems using estimation. Some lessons also include **Mental Math Hints, Problem-Solving Hints,** and **Calculator Hints.**

Previewing Your Text

Communicating Mathematics gives you a chance to show what you've learned about a math concept by talking or writing about it, or by drawing a picture or making a model.

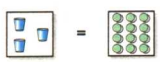
Mixed Reviews present problems that help you remember what you've learned. Lesson references tell you exactly where to look in previous lessons to restudy important concepts.

Checking for Understanding

Communicating Mathematics

Read and study the lesson to answer each question.

1. **Write** an equation in the form of $\frac{x}{a} = b$. Then explain why a cannot be 0.
2. **Tell** if 3 is a solution of $\frac{x}{3} = 12$.
   Explain why or why not.
3. **Write** the equation shown by the model at the right. Then find the solution.



Guided Practice

Complete the solution of each equation.

4. $4m = 20$
   $\frac{4m}{4} = \frac{20}{?}$
   $m =$ ____

5. $\frac{n}{12} = 3$
   $(12)\frac{n}{12} = (?)3$
   $n =$ ____

6. $42 = \frac{r}{7}$
   $42(?) = \frac{r}{7}(?)$
   ____ $= r$

Solve each equation. Check your solution.

7. $7c = 49$
8. $\frac{d}{3.1} = 7.75$
9. $9e = 54$
10. $\frac{4}{5} = \frac{1}{2}f$
11. $72 = \frac{x}{12}$
12. $\frac{y}{4} = 24$

Exercises

Independent Practice

Solve each equation. Check your solution.

13. $3c = 21$
14. $\frac{1}{2}f = \frac{2}{5}$
15. $12x = 156$
16. $34 = 2g$
17. $54 = 3p$
18. $182 = 13s$
19. $\frac{d}{3} = 17$
20. $x \div \frac{1}{8} = \frac{1}{2}$
21. $\frac{m}{4} = 11$
22. $28 = \frac{e}{4}$
23. $96 = \frac{n}{8}$
24. $13 = \frac{t}{5}$
25. $\frac{m}{5} = 1.2$
26. $\frac{p}{3.6} = 0.8$
27. $\frac{t}{2.4} = 13.5$
28. Find the solution of the equation $1.2x = 2.4$.
29. Solve the equation $0.4m = 16$.
30. **Earning Money** If Max Stahler receives 26 paychecks a year and each check is for $763.50, what is his yearly salary? To solve, use the equation $s \div 26 = 763.50$.

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Mixed Review

31. Evaluate b^5 if $b = 3$. *(Lesson 1-9)*
32. **Statistics.** Zina has seven brothers and sisters. Their ages are 5, 12, 8, 17, 14, 20, and 22. Find the mean age and median age. *(Lesson 3-5)*
33. Write the prime factorization of 24. *(Lesson 4-2)*
34. Subtract $1\frac{1}{3}$ from $4\frac{3}{4}$. *(Lesson 5-4)*
35. Solve the equation $p - 25.55 = 74.45$. *(Lesson 6-2)*

Problem Solving and Applications

36. **Engineering** In designing gasoline storage tanks, engineers multiply the government-required minimum thickness by a factor of 2.5 for added safety. Use the equation $2.5m = 1.625$, where m is the minimum thickness.
    a. Solve for m.
    b. What is the required minimum thickness?
37. **Energy** Hydrogen is being considered as a safe alternative fuel. It may also be more economical. Over long distances, the amount of hydrogen equivalent to a kilowatt-hour of electricity can be transported via pipeline for about $\frac{1}{8}$ the cost of sending the electricity through transmission lines. Use the equation $400 = \frac{1}{8}e$ to find the cost of transmitting electricity to a site where it costs only $400 to transmit hydrogen.
38. **Critical Thinking** What is wrong with the equation $m \div 0 = n$? Explain.
39. **Computers** Computer modems transmit data at different speeds. One type of modem transmits at 9,600 bits per second. This is four times faster than a second modem.
    a. Write an equation that when solved will give the speed of the second modem.
    b. Solve the equation and give the speed of the second modem.

Critical Thinking exercises give you practice in sharpening problem-solving and reasoning skills.

6 **Mid-Chapter Re**

Solve each equation by using
1. $23 + p = 71$ 2.

Solve each equation. Check y
4. $41 + w = 71$ 5.
7. $\frac{c}{1.5} = 0.3$ 8. $11b = 121$ 9. $\frac{s}{9} = 34$

Lesson 6-3 Solving Multiplication and Division Equations 231

Problem Solving and Applications in each lesson directly link math to real-world fields like engineering, and to art, history, science, and other subjects.

Previewing Your Text

Getting Into Each Chapter

Chapter

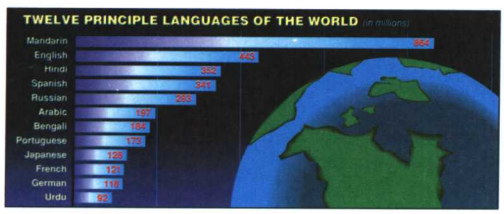
3

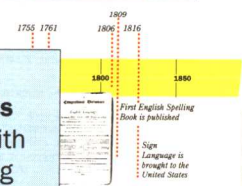
Statistics and Data Analysis

Spotlight on Languages of the World

Have You Ever Wondered. . .

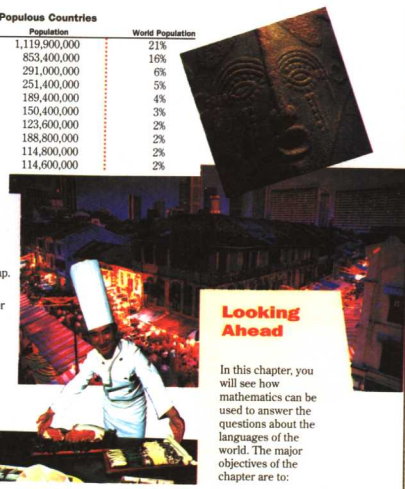
- What language is spoken by the most people in the world?
- Which countries have the most people living in them?





World's Ten Most Populous Countries

Country	Population	World Population
China	1,119,900,000	21%
India	853,400,000	16%
USSR	291,000,000	6%
United States	251,400,000	5%
Indonesia	189,400,000	4%
Brazil	150,400,000	3%
Japan	123,600,000	2%
Nigeria	188,800,000	2%
Bangladesh	114,800,000	2%
Pakistan	114,600,000	2%

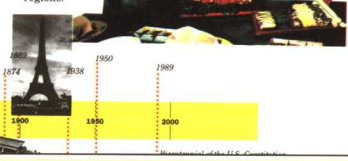


Chapter Project

Languages of the World

Work in a group.

1. Trace or copy a world map.
2. Write the language(s) spoken in each country or region.
3. Color code the map according to language.
4. Show how your map accounts for the information given about languages and the populations of various regions.



Looking Ahead

In this chapter, you will see how mathematics can be used to answer the questions about the languages of the world. The major objectives of the chapter are to:

- solve problems by using graphs
- solve problems by making a table
- construct line plots
- find the mean

Each chapter in **Mathematics: Applications and Connections** opens with a Spotlight feature focusing on topics of interest to you and your friends. In each Spotlight you'll find:

- **"Have You Ever Wondered."**. . .questions to engage your interest
- interesting **data** related to the feature
- a **timeline** or **comic** connected to relevant events
- a **Chapter Project** related to the **Spotlight** feature
- a preview of what's coming up called **Looking Ahead**

Cooperative Learning

6-3B Solving Two-Step Equations

A Follow-Up of Lesson 6-3

Objective

Solve two-step equations using models.

Materials

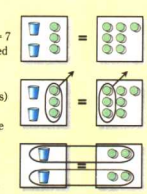
cups
counters
mats

In this lab, you will use what you know about solving one-step equations to solve two-step equations like $2x + 3 = 7$.

Try this!

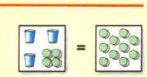
Work with a partner.

- First, let's build the equation $2x + 3 = 7$ using models. On the left side, we need two cups and three counters. On the right side, we need seven counters.
- Remember, the goal is to get the cup(s) by itself on one side of the mat. Remove three counters from each side of the mat. Now the model shows the equation $2x = 4$.
- Each cup must contain the same number of counters. Therefore, $x = 2$.



What do you think?

1. Why is an equation like $2x + 3 = 7$ called a two-step equation?
2. Write the equation that is shown at the right.



Application

Make a model of each equation. Solve the equation.

3. $3x + 1 = 7$
4. $2y + 4 = 12$
5. $5x + 1 = 11$
6. $9 = 4m + 1$
7. $3x + 5 = 14$
8. $3 = 2a + 3$

Extension

Mathematics Labs prior to or after some lessons give you hands-on experience, with a partner or group, in discovering a math concept on your own. You may also participate in shorter **Mini-Labs** in which you will investigate math concepts within a lesson.

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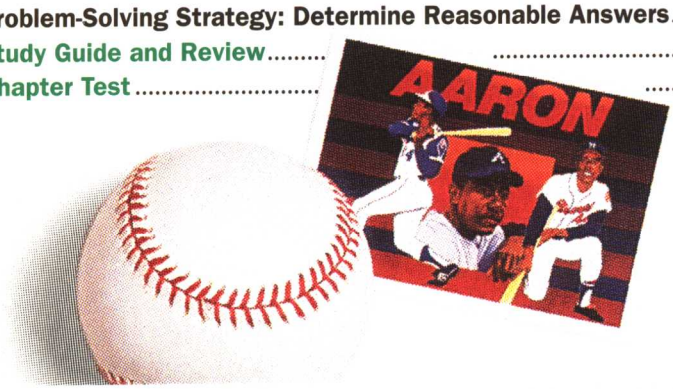
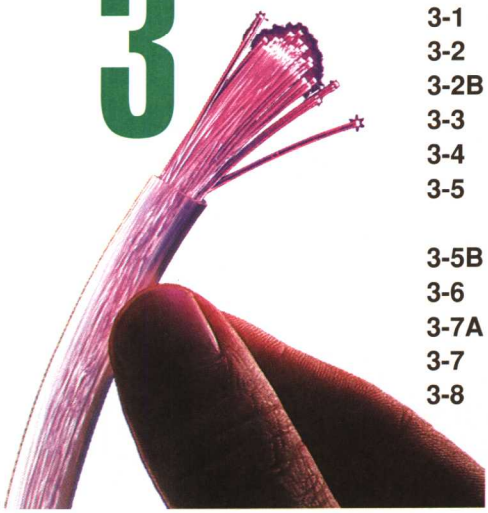


Chapter 3



Statistics and Data Analysis

Chapter 4

Patterns and Number Sense

High Interest Features

Applications and Connections

Have you ever asked yourself this question?

"When am I ever going to use this stuff?"

It may be sooner than you think! Here are two of the many ways this textbook will help you answer that question.

Applications

You'll find mathematics in all of the subjects you study in school and in your life outside of school. Lesson 1-2 on page 31, gives you good tips on saving our Earth while learning about powers and exponents. In Lesson 3-3 on page 98, range and scale are applied to talking on the phone.

These and other applications provide you with fascinating information that connects math to the real world and other school subjects and gives you a reason to learn math. Here are some more application topics.

entertainment	science
sports	social studies
smart shopping	music
hobbies	health
ecology	art

Five **DECISION MAKING** features further enable you to connect math to your real-life experiences as a consumer.

Connections

You'll discover that various areas of mathematics are very much interrelated. For example, Lesson 5-8 on page 201 shows one way in which fractions and probability are connected. Example 1 on page 322 connects algebra with making patterns with geometric shapes.

Connections to algebra, geometry, statistics, measurement, probability, and number theory help show the power of mathematics.

The **Mathematics Labs** and **Mini-Labs** also help you connect what you've learned before to new concepts. You'll use counters, measuring tapes, and many other objects to help you discover these concepts.

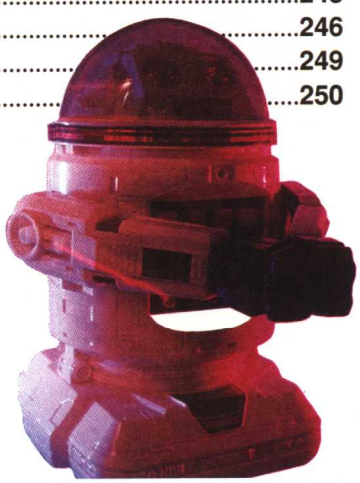
Chapter 5

Applications with Fractions

Chapter 6

An Introduction to Algebra

High Interest Features



Chapter 7

Integers

Chapter 8

Investigations in Geometry

High Interest Features

Did You Know?
259, 263, 297, 303

When Am I Ever Going To Use This?
268, 308

Cultural Kaleidoscope
276

Teen Scene
278, 307

Journal Entry
256, 258, 289, 300, 305, 329

Mini-Labs
298, 314, 321

Chapter 9

Area

Chapter 10

Surface Area and Volume

High Interest Features

Did You Know?
338, 360, 378

Teen Scene
348, 388

When Am I Ever Going To Use This?
366, 383

Cultural Kaleidoscope
386

Journal Entry
340, 353, 358, 380, 400

Mini-Labs
338, 351, 383, 395