

# *Prealgebra*

Alan S. Tussy    R. David Gustafson



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*To my wife, Liz,  
thanks for your love  
and encouragement,  
and to my three sons,  
Kevin, Glenn, and Brandon,  
who always bring me joy  
and make me proud*

*And to four grandboys,  
Daniel, Tyler,  
Spencer, and Skyler*



# PREFACE

## *For the Instructor*

The purpose of this book is to prepare students for an introductory algebra course. Its content, pedagogy, and features result from our efforts to answer this question: What prerequisite skills are necessary for success in algebra? Our goal was to write a book that is interesting and enjoyable to read—one that will attract and keep the attention of college students of all ages.

*Prealgebra* aims to teach students how to think while developing basic mathematical skills in the context of solving meaningful application problems. A variety of instructional approaches are used, reflecting the recommendations of NCTM and AMATYC. In combination with the student and instructor supplements that are available, *Prealgebra* can be used in lecture, laboratory, or self-study formats.

## Features of the text

### ***A Blend of the Traditional and Reform Approaches***

We have used a combination of instructional methods from the traditional and reform approaches, endeavoring to write a book that contains the best of both. You will find the vocabulary, practice, and well-defined pedagogy of a traditional prealgebra book. The text also features problem solving, reasoning, communicating, and technology, as emphasized by the reform movement.

### ***Variables, Equations, and Problem Solving Appear Early***

To prepare students for introductory algebra, this book provides a review of arithmetic while introducing basic algebraic concepts. For example, Chapter 1 covers whole-number arithmetic, but it also introduces the concept of a variable, develops the geometric formulas for perimeter and area, and shows how to simplify numerical expressions. In Chapter 1, we also lay the groundwork for rectangular coordinate graphing and solve some simple equations. Additionally, we establish a five-step problem-solving strategy and use it to solve real-world problems.

### ***Arithmetic and Algebra Are Integrated Throughout***

The integration of algebra and arithmetic continues throughout the book as algebraic concepts are introduced and reinforced in an arithmetic setting. In Chapter 2, after learning how to add, subtract, multiply, and divide integers, students solve equations

and application problems involving integers. In Chapter 3, The Language of Algebra, we introduce the concept of algebraic expressions, develop a formal equation-solving strategy, and expand the problem-solving model. These topics are then revisited in the context of fractions, decimals, and percents in Chapters 4, 5, and 7, respectively.

### ***Interactivity***

Most examples in the text are accompanied by a Self Check. This feature allows students to practice the skills discussed in the examples by working a similar problem. Students can refer to the solution and author's notes of the example as they solve the Self Check. The answer to each Self Check is printed underneath the problem to give students immediate feedback.

### ***Applications and Connections to Other Disciplines***

A distinguishing feature of this book is its wealth of application problems. We have included numerous applications from disciplines such as science, economics, business, manufacturing, art, music, and literature, as well as mathematics.

### ***Building a Foundation for Rectangular Coordinate Graphing***

From the beginning, we build a foundation to prepare students for the study of rectangular coordinate graphing in Chapter 6. For example, Chapter 1 introduces the number line and bar and line graphs. In subsequent chapters, this preparation continues with graphing that involves integers, fractions, and decimals.

### ***Study Sets—More Than Just Exercises***

The problems at the end of each section are called Study Sets. Each Study Set includes Vocabulary, Notation, and Writing problems designed to help the students improve their ability to read, write, and communicate mathematical ideas. The problems in the Concepts section encourage students to engage in independent thinking and reinforce major ideas through exploration. In the Practice section of the Study Sets, students get the drill necessary to master the material. In the Applications section, students deal with real-life situations that involve the topics being studied. Each Study Set concludes with a Review section consisting of problems selected from previous sections.

### ***Measurement and Unit Analysis***

In Chapter 8, we discuss measurement and unit conversion. In preparation for this chapter, some problems in earlier Study Sets require the student to read a scale or gauge.

### ***In-Depth Coverage of Geometry***

The concepts of perimeter and area are introduced in Chapter 1 and revisited throughout the book. We have also included a wide variety of plane and solid figures in the Study Sets. Since many of the students taking prealgebra did not take a geometry class in high school, Chapter 9 offers them an overview of some important geometry topics. The material is presented in a way that reinforces algebraic concepts such as formula, evaluation, and problem solving, discussed earlier in the text.

### ***Constructing Charts, Tables, and Graphs; Statistics***

Many problems require students to present their solutions in the form of a table, graph, or chart. Often, students must examine such data displays to obtain the information necessary to solve a problem. Spreadsheets are informally discussed. The concept of arithmetic mean is presented in Chapter 1 and referred to in several other chapters.


### ***Key Concepts***

Key mathematical concepts are highlighted in 11 one-page Key Concept features, distributed throughout the book. Each of these pages summarizes a concept and gives students an opportunity to review the role it plays in the overall picture.

## **Estimation**

Estimation is often used to check the reasonableness of answers. Special two-page Estimation features appear in the chapters on Whole Numbers, Decimals, and Percent. In these features, estimation procedures are introduced and put to use in real-life situations that require only approximate answers.

## **Calculators**

For those instructors who wish to use calculators as part of the instruction in this course, the text includes an Accent on Technology feature that introduces keystrokes and shows how scientific calculators can be used to solve application problems. Some Study Sets include problems that are to be solved using a calculator; these problems are indicated by the calculator logo . Instructors who do not wish to introduce

calculators can skip that material without interrupting the flow of ideas.

## **Accuracy**

To guarantee the accuracy of the answers, each exercise has been worked by both authors and another problem checker. The manuscript has been read by many reviewers, and the printed pages have been checked by several proofreaders.

## **Student support**

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We have included many features that make *Prealgebra* very accessible to students. (See the examples on pages xi–xiv.)

### **Worked Examples**

The text contains more than 400 worked examples. Explanatory notes, written using complete sentences, make the examples easy to follow.

### **Self Checks**

There are more than 325 Self Check problems that allow students to practice the skills demonstrated in the worked examples.

### **Author's Notes**

Author's notes, printed in red, are used to explain the steps in the solutions of examples. These notes are written using complete sentences so as to increase the students' ability to read and write mathematics.

### **Functional Use of Color**

For easy reference, definition boxes, strategy boxes, and rule boxes are color-coded. In addition, the book uses color to highlight terms and expressions that you would point to in a classroom discussion.

### **Problems**

The book includes more than 5,200 carefully graded exercises. In the Annotated Instructor's Edition, answers are printed in blue beside the problems. In the student edition, an appendix provides the answers to most of the odd-numbered exercises in the Study Sets as well as all the answers to the Chapter Review, Chapter Test, and Cumulative Review problems.

### **Systematic Review**

Each Study Set ends with a Review section that contains problems selected from previous sections. Each chapter ends with a Chapter Review and a Chapter Test. In a unique format, the Chapter Review lists the important concepts of each section in parallel with appropriate review problems. In addition, Cumulative Review Exercises appear after Chapters 2, 4, 6, and 9.


## **Study Skills and Math Anxiety**

These two topics are discussed in detail in the section entitled For the Student at the end of this preface. In Success in Prealgebra, students are asked to design a personal strategy for studying and learning the material. Taking a Math Test helps students prepare for a test and then gives them suggestions for improving their performance.

## **Reading and Writing Mathematics**

Also included (on pages xviii–xix) are two features to help students improve their ability to read and write mathematics. Reading Mathematics helps students get the most out of the examples in this book by showing them how to read the solutions properly. Writing Mathematics highlights the characteristics of a well-written solution.

## **Videotapes**

The videotape series that accompanies this book uses eye-catching computer graphics to show students the steps in solving many examples in the text. A video logo  placed by an example indicates that the example is taught on tape. The videotapes are interactive; after seeing an example worked, students are asked to pause the tape and work the accompanying Self Check problem on their own.

## **Ancillaries**

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### **Annotated Instructor's Edition**

In the Annotated Instructor's Edition, the answers are printed next to the exercises.  
ISBN: 0-534-34327-9

### **Instructor Videotapes**

This is a unique set of ten-minute videos, each corresponding to a chapter of the book. Each video is designed to be shown in class the day a new chapter is started. These introductory videos show how the topics to be covered have application in everyday life.

ISBN: 0-534-34395-3

### **Computerized Test Items**

**EXPTTEST** This testing system for DOS and Windows platforms provides multiple-choice, true-false and open-ended questions. Because it includes access to *EXP: The Scientific Word Processor*, instructors can easily edit question banks, import graphics, and create multiple versions of an examination.

ISBN: 0-534-34398-8 (DOS); ISBN: 0-534-34399-6 (Windows)

**ESATEST** Available for DOS, Windows, or Macintosh platforms, ESATEST also provides the ability to edit the question banks. An algorithmic module allows multiple tests or questions to be generated by a single question template. With ESATEST, instructors can also administer on-line testing through any of three mediums: Network System, Telecommunications, or Personal Computer.

ISBN: 0-534-34839-4 (DOS); ISBN: 0-534-34840-8 (Windows); ISBN: 0-534-34397-X (Macintosh)

### **Printed Test Items**

This material (by Gene Hart) contains four ready-to-use forms of every chapter test, two multiple-choice and two free-response.

ISBN: 0-534-34577-8

(continued on page xv)



# Examples of Features in the Text

## 3.2 Evaluating Algebraic Expressions and Formulas

In this section, you will learn about

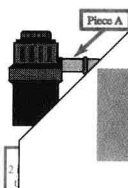
- Evaluating algebraic expressions
- Formulas
- Formulas from business
- Formulas from science
- Formulas from mathematics

**INTRODUCTION.** An algebraic expression is a combination of variables and numbers with the operation symbols of addition, subtraction, multiplication, and division. In this section, we will be replacing the variables in these expressions with specific numbers. Then, using the rule for order of operations, we will evaluate each expression.

We will also study formulas. Like algebraic expressions, formulas involve variables.

### Evaluating algebraic expressions

The manufacturer's instructions for installing a kitchen garbage disposal include the diagram in Figure 3-4. Word phrases are used to describe the lengths of the pieces of pipe that are necessary to connect the disposal to the drain line.



### Dividing fractions

To divide fractions, multiply the first fraction by the reciprocal of the second fraction. In symbols, if  $a$ ,  $b$ ,  $c$ , and  $d$  are any numbers, then

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} \quad (b \neq 0, c \neq 0, d \neq 0)$$

For example, to work the problem  $\frac{5}{7} \div \frac{3}{4}$ , we multiply the first fraction by the reciprocal of the second.

$$\begin{array}{ccc} \text{Change the division} & & \\ \text{to a multiplication.} & & \\ \frac{5}{7} \div \frac{3}{4} & = & \frac{5}{7} \cdot \frac{4}{3} \\ \text{The reciprocal of} & & \\ \frac{3}{4} \text{ is } \frac{4}{3}. & & \end{array}$$

$$= \frac{20}{21}$$

Multiply in the numerator and denominator:  
 $5 \cdot 4 = 20$  and  $7 \cdot 3 = 21$ .

$$\text{Therefore, } \frac{5}{7} \div \frac{3}{4} = \frac{20}{21}.$$

**EXAMPLE 2** Dividing fractions. Divide:  $\frac{1}{3} \div \frac{4}{5}$ .

**Solution**

$$\frac{1}{3} \div \frac{4}{5} = \frac{1}{3} \cdot \frac{5}{4} \quad \text{Multiply } \frac{1}{3} \text{ by the reciprocal of } \frac{4}{5}, \text{ which is } \frac{5}{4}.$$

$$= \frac{1 \cdot 5}{3 \cdot 4} \quad \text{Multiply the numerators and multiply the denominators.}$$

$$= \frac{5}{12} \quad \text{Multiply in the numerator and denominator.}$$



**EXAMPLE 3** Dividing fractions. Divide:  $\frac{9}{16} \div \frac{3}{20}$ .

**Solution**

$$\frac{9}{16} \div \frac{3}{20} = \frac{9}{16} \cdot \frac{20}{3} \quad \text{Multiply } \frac{9}{16} \text{ by the reciprocal of } \frac{3}{20}, \text{ which is } \frac{20}{3}.$$

$$= \frac{9 \cdot 20}{16 \cdot 3} \quad \text{Multiply the numerators and multiply the denominators.}$$

$$= \frac{3 \cdot 3 \cdot 4 \cdot 5}{4 \cdot 4 \cdot 3} \quad \text{Factor 9 as } 3 \cdot 3, 20 \text{ as } 4 \cdot 5, \text{ and } 16 \text{ as } 4 \cdot 4.$$

$$= \frac{\cancel{3} \cdot 3 \cdot \cancel{4} \cdot 5}{\cancel{4} \cdot 4 \cdot \cancel{3}} \quad \text{Divide out the common factors of 3 and 4.}$$

$$= \frac{15}{4} \quad \text{Multiply in the numerator and denominator.}$$

**Self Check**

Divide:  $\frac{2}{3} \div \frac{7}{8}$ .

**Answer:**  $\frac{16}{21}$

**Self Check**

Divide:  $\frac{4}{5} \div \frac{8}{25}$ .

**Answer:**  $\frac{5}{2}$

Major concepts are summarized in three ways: in words, in symbols using variables, and with a diagram.

Each example has a title.

Each step is justified using detailed author's notes. Complete sentences are used.

A Self Check offers the student the opportunity to work a problem similar to the one in the example.

The Self Check answer is printed for immediate feedback for the student.

◀ The title of each subsection is listed below the section heading.

◀ Major concepts are introduced using a specific example.

## Solving problems

**EXAMPLE 9 Business expenses.** A business decides to rent a copy machine instead of buying one. Under the rental agreement, the company is charged \$65 per month plus 2 cents for every copy made. If the business has budgeted \$125 for copier expenses each month, how many copies can be made before exceeding the budget?

**Analyze the problem** We are asked to find the maximum number of copies that can be made.

Notice that the costs are expressed in terms of dollars and cents. We need to work in terms of one unit, so we write 2 cents as \$0.02 and work in terms of dollars.

**Form an equation** There is only one unknown quantity.

Let  $x$  = the maximum number of copies that can be made.

We can write the amount budgeted for copier expenses in two ways.

The basic fee plus the cost of the copies is 125.

We can find the total cost of the copies by multiplying the cost per copy by the maximum number of copies that can be made.

65 plus 0.02 · the maximum number of copies made is 125.

65 + 0.02 ·  $x$  = 125

**Solve the equation**

$$65 + 0.02x = 125$$

$$65 + 0.02x - 65 = 125 - 65 \quad \text{Subtract 65 from both sides.}$$

$$0.02x = 60 \quad \text{Simplify.}$$

$$\frac{0.02x}{0.02} = \frac{60}{0.02} \quad \text{Divide both sides by 0.02.}$$

$$x = 3,000 \quad \text{Do the divisions.}$$

**State the conclusion** The business can make up to 3,000 copies each month without exceeding its budget.

**Check the result** If we multiply the cost per copy and the maximum number of copies, we get  $0.02 \cdot 3,000 = \$60$ . Then we add the \$65 monthly fee:  $\$60 + \$65 = \$125$ . The answer checks. ■

## STUDY SET Section 5.6

**VOCABULARY** In Exercises 1–4, fill in the blanks to make a true statement.

- To \_\_\_\_\_ an equation, we isolate the variable on one side of the equals sign.
- $4.1(x + 3) = 4.1x + 4.1(3)$  is an example of the use of the \_\_\_\_\_ property.
- In the term  $5.65t$ ,  $5.65$  is called the numerical \_\_\_\_\_.
- A \_\_\_\_\_ is a letter that is used to stand for a number.

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◀ A five-step problem-solving strategy is used throughout the text: analyze, form an equation, solve, state, and check. In some Study Sets, the first two application problems are set up in the five-step format, with certain parts left blank for the students to complete.

## Equations involving polynomials

We graphed the linear equations

$$y = \frac{1}{2}x + 1 \quad \text{The polynomials } 2x - 1 \text{ and } \frac{1}{2}x + 1 \text{ are both of degree 1.}$$

Equations involving second-degree polynomials.

Graph

**Self Check**

Graph  $y = x^2 - 1$ .

finding the correspond-

To get the graph, we See Figure 6-12.)

**Answer:**

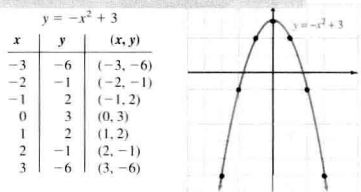
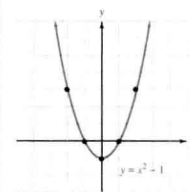


FIGURE 6-12

The graph of this equation is called a parabola.



**WARNING!** When an equation is nonlinear, its graph is not a line. To graph nonlinear equations, we must usually plot many points to recognize the shape of the curve.



Warnings help students avoid common mistakes. ▶

## STUDY SET Section 6.3

**VOCABULARY** Fill in the blanks to make a true statement.

- A polynomial with one algebraic term is called a \_\_\_\_\_.
- A polynomial with three algebraic terms is called a \_\_\_\_\_.
- A polynomial with two algebraic terms is called a \_\_\_\_\_.
- The degree of a polynomial is the \_\_\_\_\_ as the degree of its term with \_\_\_\_\_ degree.

6.3 Introduction to Polynomials 377

# CHAPTER REVIEW

## SECTION 4.1

## The Fundamental Property of Fractions

### CONCEPTS

Fractions are used to indicate equal parts of a whole.

A fraction is composed of a numerator, a denominator, and a fraction bar.

If  $a$  and  $b$  are positive numbers,

$$\frac{-a}{b} = -\frac{a}{b} = \frac{a}{-b} \quad (b \neq 0)$$

Equivalent fractions represent the same number.

The fundamental property of fractions: Dividing the numerator and denominator of a fraction by the same nonzero number does not change the value of the fraction.

To simplify a fraction that is not in lowest terms, divide the numerator and denominator by the same number.

A fraction is in lowest terms if the only common factor the numerator and denominator share is 1.

The fundamental property of fractions: Multiplying the numerator and denominator of a fraction by a nonzero number does not change its value.

### REVIEW EXERCISES

- If a woman gets seven hours of sleep each night, what part of a whole day does she spend sleeping?

- In Illustration 1, why can't we say that  $\frac{3}{4}$  of the figure is shaded?



ILLUSTRATION 1

- Write the fraction  $\frac{4}{6}$  in two other ways.

- What concept about fractions does Illustration 2 demonstrate?

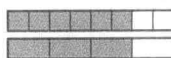


ILLUSTRATION 2

- Explain the procedure shown here.

$$\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

- Explain what the slashes and the 1's mean.

$$\frac{4}{6} = \frac{1}{2} \cdot \frac{2}{3} = \frac{2}{3}$$

- Simplify each fraction.

a.  $\frac{15}{45}$       b.  $\frac{24}{36}$

- Simplify each fraction.

a.  $\frac{20}{24}$       b.  $\frac{18}{24}$

**Solution** Let  $x$  = the number of cars purchased.

**Key word:** reduced

**Translation:** subtract

**Key phrase:** \$100 for each car

**Translation:** multiply

Since the price per car is reduced by \$100 for each of the  $x$  cars purchased, the discount on each car is \$100 $x$ . The price of each car starts at \$20,000 and then has \$100 $x$  subtracted from it. Therefore,

$$\text{Cost per car} = 20,000 - 100x$$

## STUDY SET

## Section 3.1

**VOCABULARY** In Exercises 1–4, fill in the blanks to make a true statement.

- An \_\_\_\_\_ is a combination of variables, numbers, and the operation symbols for addition, subtraction, multiplication, and division.
- The answer to an addition problem is called the \_\_\_\_\_. The answer to a subtraction problem is called the \_\_\_\_\_.
- A \_\_\_\_\_ is a letter that is used to stand for a number. A \_\_\_\_\_ is a number that is fixed and does not change its value.
- The answer to a multiplication problem is called the \_\_\_\_\_. The answer to a division problem is called the \_\_\_\_\_.

### CONCEPTS

- Write two different algebraic expressions that contain the numbers 10 and 3 and the variable  $x$ .
- Write an equation with one side containing an algebraic expression and the other the number 20.
- Illustration 1 shows the commute to work (in miles) for two men who work at the same location.

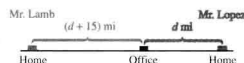


ILLUSTRATION 1

- Write an expression for how far each man lives from work.
- Who lives farther from the office? How much farther?

- See Illustration 2.

- If we let  $b$  represent the height of the birch tree, write an algebraic expression for the height of the elm tree.
- If we let  $e$  stand for the height of the elm tree, write an algebraic expression that represents the height of the birch tree.

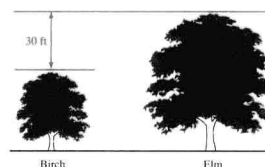


ILLUSTRATION 2

- In 1995, the business profits of a video rental store were double those of the previous year. In 1996, the profits were triple those of 1994. Use a variable and algebraic expressions to complete the bar graph in Illustration 3.

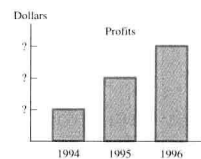


ILLUSTRATION 3

◀ The Chapter Review includes the important concepts of each section, listed alongside appropriate review problems.

At the end of each section is a ► comprehensive Study Set, divided into seven parts: Vocabulary, Concepts, Notation, Practice, Applications, Writing, and Review.

Algebraic concepts are introduced ► in an arithmetic setting. Students learn to model situations.

To solve problems, students create ► and interpret graphs, tables, and diagrams.

## KEY CONCEPT

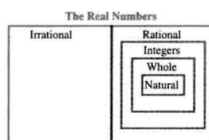
# The Real Numbers

A **real number** is any number that can be expressed as a decimal. All of the types of numbers that we have discussed in this book are real numbers. As we have seen, the set of real numbers is made up of several subsets of numbers.

In Exercises 1–5, if possible, list the numbers belonging to each set. If it is not possible to list them, define the set in words.

- |                       |                     |
|-----------------------|---------------------|
| 1. Natural numbers    | 2. Whole numbers    |
| 3. Integers           | 4. Rational numbers |
| 5. Irrational numbers |                     |

This diagram shows how the set of real numbers is made up of two distinct sets: the rational and the irrational numbers. Since every natural number is a whole number, we show the set of natural numbers included in the whole numbers. Because every whole number is an integer, the whole numbers are shown contained in the integers. Since every integer is a rational number, we show the integers included in the rational numbers.



In Exercises 6–15, tell whether each statement is true or false.

- |   |   |
|---|---|
| 6. Every integer is a real number.                    | 7. Every fraction can be written as a terminating decimal.          |
| 8. Every real number is a whole number.               | 9. Some irrational numbers are integers.                            |
| 10. Some rational numbers are natural numbers.        | 11. No numbers are both rational and irrational numbers.            |
| 12. All real numbers can be graphed on a number line. | 13. The set of whole numbers is a subset of the irrational numbers. |
| 14. All decimals either terminate or repeat.          | 15. Every natural number is an integer.                             |
16. List the numbers in the set  $\{-2, -1.2, -\frac{1}{8}, 0, 1\frac{3}{4}, 2.75, \sqrt{23}, 10, 1.161661666 \dots\}$  that are
- |                       |                     |
|-----------------------|---------------------|
| a. Natural numbers    | b. Whole numbers    |
| c. Integers           | d. Rational numbers |
| e. Irrational numbers | f. Real numbers     |

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◀ Eleven key concepts from the course are highlighted on special pages.

the divisor and dividend.

decimal point of the

Answer: 0.93

## Long Division

on process ended after we obtained a zero from the second the division process **terminated**. Sometimes when dividing, we have a zero remainder, and the division process continues forward the result.

**Example:** Divide:  $\frac{2.35}{0.7}$ . Round to the nearest hundredth.

1. we have  $0.7 \overline{)2.35}$ .

$$\begin{array}{r} 0.7 \overline{)2.35} \\ 7 \overline{)23.500} \\ \underline{3.357} \\ 7 \overline{)23.500} \\ \underline{21} \\ 25 \\ \underline{21} \\ 40 \\ \underline{35} \\ 50 \\ \underline{49} \\ 1 \end{array}$$

To the nearest hundredth, the answer is 3.36.

Accent on Technology boxes appear throughout the text.

Keystrokes are introduced when necessary.

## Accent on Technology

### The nucleus of a cell

The nucleus of a cell contains vital information about the cell in the form of DNA. The nucleus is very small in size: A typical animal cell has a nucleus that is only 0.00023622 inch across. How many nuclei would have to be laid end-to-end to extend to a length of 1 inch?

To find how many 0.00023622-inch lengths there are in 1 inch, we must use division.

**Evaluate:**  $1 \div 0.00023622$ .

**Keystrokes:**  $1 \div 0.00023622 = 4233.3418$

It would take approximately 4,233 nuclei laid end-to-end to extend to a length of 1 inch.

## **Complete Solutions Manual and Transparency Masters**

This manual (by Catherine Gong) provides complete solutions to all exercises in the text, as well as transparency masters.

ISBN: 0-534-34387-2

## **Text-Specific Videotape Series**

A set of book-specific videotapes is available without charge to adopters of this text (limited to one set per department). The videos include worked-out solutions to most of the examples in the book, as well as solutions to the Self Check problems.

ISBN: 0-534-34652-9

## **Brooks/Cole Exerciser 2.0 (BCX)**

BCX is book-specific tutorial software by Laurel Technical Services. Available for DOS, Windows and Macintosh platforms, BCX instructs and drills students on problems similar to those found in the text. BCX provides hints to students; if they cannot answer a question correctly on two tries, BCX displays the complete solution. BCX also monitors student progress and includes a printed or on-line reporting system. BCX is complimentary to professors upon adoption.

ISBN: 0-534-34393-7 (DOS); ISBN: 0-534-34394-5 (Windows); ISBN: 0-534-34388-0 (Macintosh)

## **Student Solutions Manual**

The *Student Solutions Manual* (by Catherine Gong) includes complete solutions for odd-numbered exercises in the text. It is available for sale at college bookstores.

ISBN: 0-534-34386-4

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## ***For the Student***

### **Success in prealgebra**

To be successful in mathematics, you need to know how to study it. The following checklist will help you develop your own personal strategy to study and learn the material. The suggestions listed below require some time and self-discipline on your part, but it will be worth the effort. This will help you get the most out of this course.

As you read each of the following statements, place a check mark in the box if you can truthfully answer Yes. If you can't answer Yes, think of what you might do to make the suggestion part of your personal study plan. You should go over this checklist several times during the semester to be sure you are following it.

#### ***Preparing for the Class***

- ☐ I have made a commitment to myself to give this course my best effort.
- ☐ I have the proper materials: a pencil, paper, a notebook, a ruler, a protractor, a calculator, and a calendar or day planner.
- ☐ I am willing to spend a minimum of two hours doing homework for every hour of class.
- ☐ I will try to work on this subject every day.
- ☐ I have a copy of the class syllabus. I understand the requirements of the course and how I will be graded.
- ☐ I have tried to schedule a free hour after mathematics class to give me time to review my notes and begin the homework assignment.

#### ***Class Participation***

- ☐ I will regularly attend the class sessions and be on time.
- ☐ When I am absent, I will find out what the class studied, get a copy of the notes, and make up the work that was assigned when I was gone.
- ☐ I sit where I can hear the instructor and see the chalkboard.
- ☐ I will pay attention in class and take careful notes.
- ☐ I will ask the instructor questions when I don't understand the material.
- ☐ When tests, quizzes, or homework papers are passed back and discussed in class, I will write down the correct solutions for the problems I missed so that I can learn from my mistakes.

#### ***Study Sessions at Home***

- ☐ I will find a comfortable and quiet place to study.
- ☐ I realize that reading a math book is different than reading a newspaper or novel. Quite often, it will take more than one reading to understand the material.
- ☐ After studying an example in the textbook, I will work the accompanying Self Check.
- ☐ I will begin the homework assignment only after reading the material.
- ☐ I will try to use the mathematical vocabulary mentioned in the book and used by my instructor when writing or talking about the topics studied in this course.
- ☐ I will look for opportunities to explain the material to others.
- ☐ I will check all my answers to the problems with those provided in the back of the book (or with the *Student Solutions Manual*) and reconcile any differences.
- ☐ My homework will be organized and neat. My solutions show all the necessary steps.

- ☐ I will try to work some review problems each day.
- ☐ After completing the homework assignment, I will read the next section to prepare for the coming class session.
- ☐ I will keep a notebook containing my class notes, homework papers, quizzes, and tests—all in order by date.

### **Special Help**

- ☐ I know my instructor's office hours and am willing to go in to ask for help.
- ☐ I have formed a study group with classmates that meets regularly to discuss the material and work on problems.
- ☐ When I need additional explanation of a topic, I will view the videotape series that comes with the textbook and use the tutorial software.
- ☐ I will take advantage of extra tutorial assistance that my school offers for mathematics courses.
- ☐ I have purchased and use the *Student Solutions Manual* that accompanies this text.

To follow each of these suggestions will take time. It takes a lot of practice to learn mathematics, just like any other skill.

No doubt, you will sometimes become frustrated along the way. This is natural. When it occurs, take a break and come back to the material after you have had time to clear your thoughts. Keep in mind that the skills and discipline you learn in this course will help make for a brighter future. Good luck!

## **Taking a math test**

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The best way to relieve anxiety about taking a mathematics test is to know that you are well-prepared for it and that you have a plan. Before any test, ask yourself three questions. When? What? How?

### **Preparing for the Exam**

**When** will I study?

1. When is the test? \_\_\_\_\_  
I will begin to review on \_\_\_\_\_.
2. Times I can study for the test:

**What** material will the test cover?

1. What sections will the test cover?
2. Has the instructor indicated any types of problems that are guaranteed to be on the exam?

**How** will I prepare for the exam?

Put a check mark by each method of review that you will use to prepare for the test.

- ☐ Review the class notes.
- ☐ Outline the chapter on a piece of poster board to see the big picture and the relationships between topics.
- ☐ Recite the important formulas, definitions, vocabulary, and rules into a tape recorder.
- ☐ Make flash cards for the important formulas, definitions, vocabulary, and rules.

- ☐ Rework problems from the homework assignments.
- ☐ Rework each of the Self Check examples in the text.
- ☐ Form a study group to discuss the topics to be tested.
- ☐ Complete the Chapter Review.
- ☐ Take the Chapter Test.
- ☐ Review the warnings given in the text.
- ☐ Work on improving your speed in answering questions.
- ☐ Review the methods that can be used to check answers.
- ☐ Write a sample test, trying to think of the questions the instructor will ask.
- ☐ Complete the Cumulative Review Exercises.
- ☐ Get organized the night before the test. Have materials ready to go so that the trip to class will not be hurried.
- ☐ Take some time to relax immediately before the test. Don't study right up to the last minute.

### ***Taking the Test***

Here are some tips that can help improve your performance on a mathematics exam.

- When you receive the test, scan it, looking for the types of problems you had expected to be on the test. Do them first.
- Read the instructions carefully.
- Write down any formulas or rules as soon as you receive the test.
- Don't spend too much time on one problem until you have attempted all the problems.
- If your instructor gives partial credit, at least try to begin a solution. Don't get shut out.
- Save the most difficult problems for last.
- Don't be afraid to skip a problem and come back to it later.
- If you finish early, go back over your work and look for mistakes.

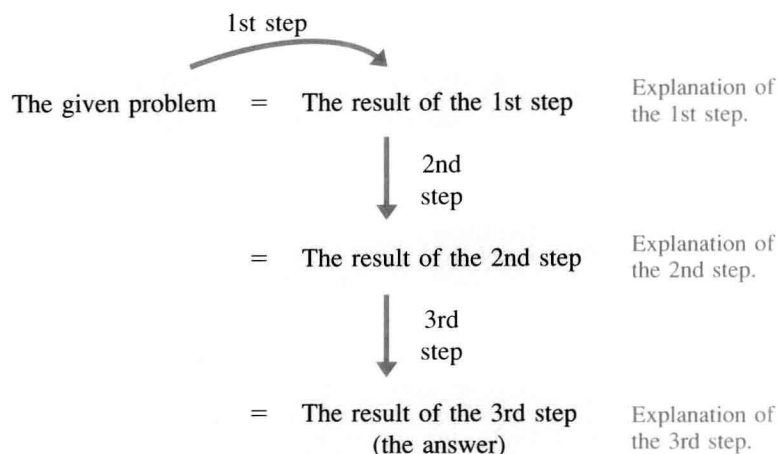
## **Reading mathematics**

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To get the most out of this book, you need to learn how to read it correctly. A mathematics textbook must be read differently than a novel or a newspaper. For one thing, you need to read it slowly and carefully. At times, you will have to reread a section to understand its content. You should also have pencil and paper with you when reading a mathematics book, so that you can work along with the text to understand the concepts being presented.

Perhaps the most informative parts of a mathematics book are its examples. Each example in this textbook consists of a problem and its corresponding solution. One form of solution that is used many times in this book is shown in the diagram on the next page. It is important that you follow the "flow" of its steps if you are to understand the mathematics involved. For this solution form, the basic idea is this: A property, rule, or procedure is applied to the original expression to obtain an equivalent expression. We show that the two expressions are equivalent by writing an equals sign between them. The property, rule, or procedure that has been used is then listed next to the equivalent expression in the form of an author's note. The process of writing equivalent expressions and explaining the reasons behind them continues, step by step, until the final result is obtained. The solution in the following diagram consists of three steps, but solutions have varying lengths.

### A solution (one of the basic forms)



## Writing mathematics

One of the major objectives of this course is for you to learn how to write solutions to problems properly. A written solution to a problem should explain your thinking in a series of neat and organized mathematical steps. Think of a solution as a mathematical essay—one that your instructor and other students should be able to read and understand. Some solutions will be longer than others, but they must always be in the proper format and use the correct notation. To learn how to do this will take time and practice.

To give you an idea of what will be expected, let's look at two samples of student work. In the first, we have highlighted some of the important characteristics of a well-written solution. The second sample is poorly done and would not be acceptable.

Add:  $\frac{1}{3} + \frac{1}{4}$ .

### A well-written solution:

The problem was copied from the textbook.

$$\frac{1}{3} + \frac{1}{4} = \frac{1 \cdot 4}{3 \cdot 4} + \frac{1 \cdot 3}{4 \cdot 3}$$

The first step of the solution is written here.

$$= \frac{4}{12} + \frac{3}{12}$$

The steps are written under each other in a neat, organized manner.

$$= \frac{7}{12}$$

The equals signs are lined up vertically.

### A poorly written solution:

The problem wasn't copied from the textbook.

$$\frac{1}{3} \cdot 4 = \frac{4}{12} =$$

An equals sign is improperly used.

$$\frac{1}{4} \rightarrow \frac{3}{12}$$

$$\frac{3}{+4} \quad \left( \frac{7}{12} \right)$$

The work is disorganized and difficult to follow.