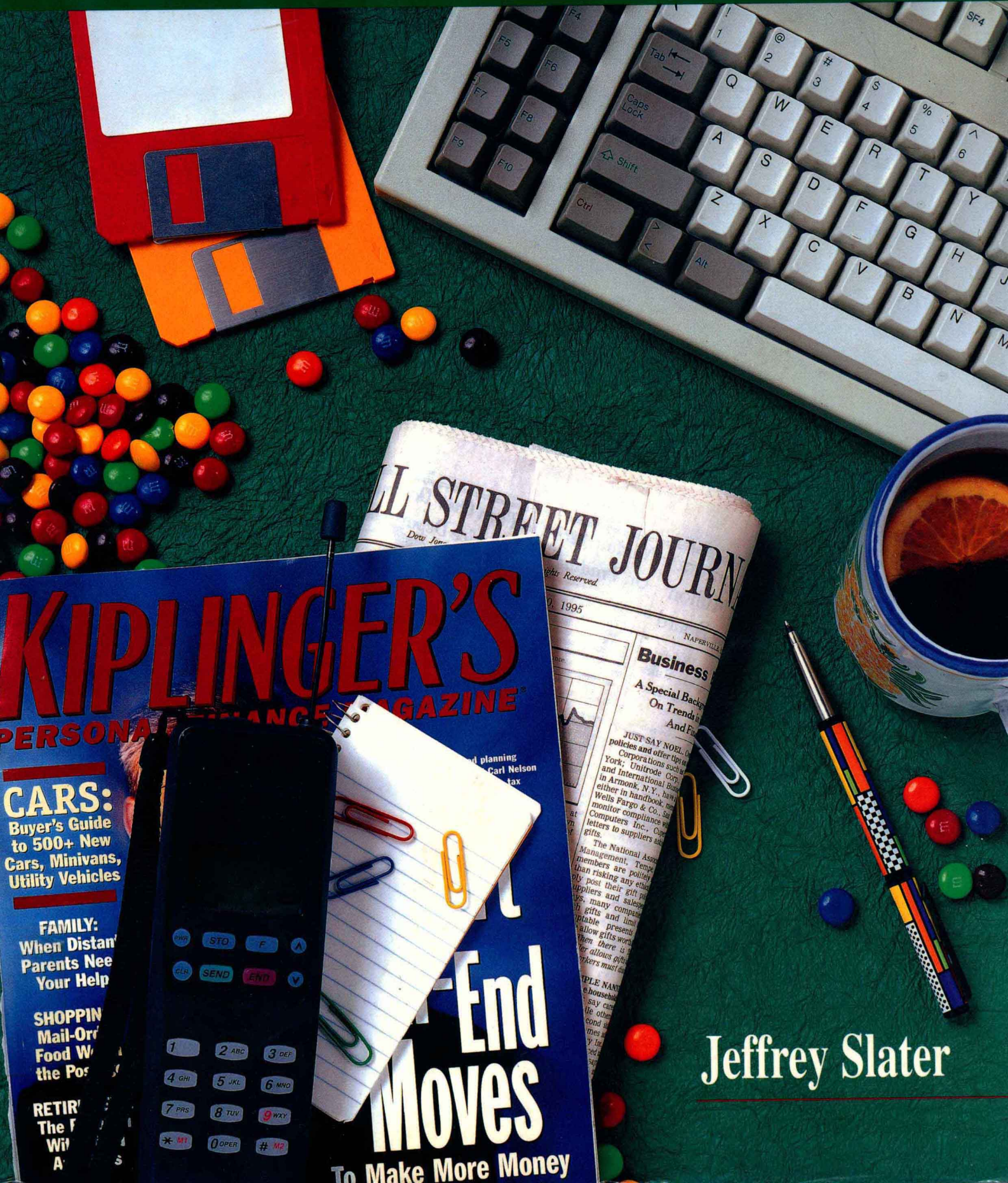# Practical Business Math Procedures

Fifth Edition

Jeffrey Slater

Practical Business Math Procedures

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Jeffrey Slater

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To Abby, to Rusty, to Molly,
to Scupper, and to Shelley
Love, Jeff

Preview of Special Features

Before looking at how to succeed in each chapter, let's look at some of the book's special features.

1. **The toll-free, 24-hour hotline.** This toll-free number for students allows you to call anytime and get extra help on any of the 22 summary practice tests located at the end of each chapter. As the author, I have recorded messages on how you should solve each problem. Think of this hotline as a pre-exam tune-up. The toll-free number is 1-800-338-9708.

2. **Group activity: A Kiplinger approach.** In each chapter you can debate a business math issue I raise based on a *Kiplinger's Personal Finance Magazine* article that is presented. Forms for all group activities are provided. This is great for critical thinking, as well as improving your writing skills.

3. *The Wall Street Journal* **newspaper.** This newspaper insert helps explain how to read *The Wall Street Journal,* as well as show how business math relates to it. New to this edition is a section on mutual funds. The newspaper is page-referenced to the text and is helpful for those who have never followed stocks, bonds, and mutual funds.

4. *Business Math Handbook and Study Guide.* This reference guide contains all the tables found in the text. It makes homework, exams, etc. easier to deal with than flipping back and forth through the text. The *Handbook* also features a built-in study guide that provides self-paced worksheets that review each chapter's vocabulary, theory, and math applications. A set of 10 extra word problems for each chapter is included.

5. **Blueprint aid boxes.** For the first eight chapters (not in Chapter 4), blueprint aid boxes are available to help you map out a plan to solve a word problem.

6. **Videotapes.** There is a complete set of videotapes that review all the practice quizzes in the text.

7. **The business math tutor.** This software is a highly visual tutorial that guides you through the entire text. It is highly visual and user friendly.

8. **Spreadsheet templates.** Excel® templates are available for selected end-of-chapter problems. You can run these templates as is or enter your own data. The template disk also includes an interest table feature that enables you to input any percentage rate and any terms. The program will then generate table values for you.

9. **The Internet organizer.** Your instructor (in the resource box) has a table showing the web address for certain business math topics, along with what you can expect to find at that site.

10. **How to use the calculator.** On the inside front cover of your text is a handy reference guide on how to use the calculator (memory, etc.).

How to Read and Use the Book

The colors in this text have a purpose. You should read the description below, then look at several pages to see how it works.

Color key

- **Blue:** Movement, cancellations, steps to solve, arrows, blueprints
- **Gold:** Formulas and steps
- **Green:** Tables and forms
- **Red:** Key items we are solving for

Chapters

Each chapter is broken down into learning units. Each learning unit covers a key concept or a small group of concepts. Be sure to look at the Did You Know? along with the math application.

Learning Objectives

At the beginning of each chapter you'll find a list of learning objectives. Each is page referenced.

Practice Quizzes

At the end of each learning unit is a practice quiz, followed by solutions. These provide you with immediate feedback on your understanding of the unit. These are all solved on videotapes. Check with your instructor for availability.

Chapter Organizer

At the end of each chapter is a quick reference guide called the chapter organizer. Key points, formulas, and examples are provided. A list of key vocabulary terms is also included. All have page references. (A complete glossary is found at the end of the text.) Think of the chapter organizer as your set of notes.

Critical Thinking Discussion Questions

Factual, as well as thought-provoking, questions appear after the chapter organizer.

Problems

At the end of each chapter is a complete set of drill and word problems. Check figures for the odd-numbered problems are located in Appendix B.

Challenge Problems

The last two word problems in each chapter try to let you "stretch" your business math skills. These are harder and require more effort.

Additional Homework Assignments by Learning Unit

At the end of the text in Appendix A is a complete set of drill and word problems arranged by learning unit. These can be used for additional reinforcement. Your instructor may ask you to turn these in. Check figures for the odd-numbered problems are shown in Appendix B. On the inside back cover of the book is a table showing page references for each assignment.

Summary Practice Test

This a test before the test. All questions are page referenced back to the topic so you can check your methods. The test is a combination of drill and word problems. Check figures for *all* practice tests are in Appendix B. Remember: There is a toll-free hotline to review these tests.

Business Math Scrapbook

At the end of each chapter you will find actual clippings from *The Wall Street Journal* and various other publications. These articles will give you a chance to use the theory provided in the chapter to apply to the real world. It allows you to put your math skills to work.

Cumulative Reviews

At the end of Chapters 3, 8, and 13 are word problems that test your retention of business math concepts and procedures. Check figures for *all* cumulative review problems are in Appendix B.

Jeffrey Slater

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Whole Numbers;
How to Dissect and
Solve Word Problems

LEARNING UNIT *Objectives*

LU 1–1: Reading, Writing, and Rounding Whole Numbers
- Use place values to read and write whole numbers (*pp. 5–6*).
- Round whole numbers to indicated position (*pp. 6–7*).
- Use blueprint aid for dissecting and solving a word problem (*pp. 7–8*).

LU 1–2: Adding and Subtracting Whole Numbers
- Add whole numbers; check and estimate addition computations (*pp. 9–11*).
- Subtract whole numbers; check and estimate subtraction computations (*pp. 9–11*).

LU 1–3: Multiplying and Dividing Whole Numbers
- Multiply whole numbers: check and estimate multiplication computations (*pp. 12–14*).
- Divide whole numbers; check and estimate division computations (*pp. 14–16*).

Business decision making usually involves numbers. Numbers answer questions such as, How much? How many? How soon? How far? How high? and How low? People of all ages make business decisions based on the answers to number questions.

Companies often use numbers to measure their market-share performance and make future policy decisions. This *Wall Street Journal* information illustrates how sales numbers influenced the change in the business strategy of Toys "Я" Us.

Courtesy Toys "Я" Us

Toys "Я" Us Grows Up: Arcades Get Big-Profit Videos First; Discounters Feast on Firm's Sales

The growing pains of competition have affected the performance of Toys "Я" Us. Wal-Mart Stores and other broad-range discounters have taken the lead in toy discounting. The sales from video games have decreased because arcades receive the hot video games before retailers. Foreign-store profits have been below expectations.

To regain its position as one of the most profitable retailers in the nation, Toys "Я" Us is changing its image. The company is replacing its stocked-to-the-rafters warehouse image with the image of store-within-the-store boutiques such as the new Learning Center. This department will feature electronic toys aimed at helping children learn and will have a knowledgeable new service staff.

To compete with discounters, Toys "Я" Us plans to make deeper price cuts and offer more promotions. It also plans to stock an array of personal-computer games, which have cut into video-game sales. Nearly all stores will add new outdoor play departments.

Toys "Я" Us has a goal of $175 million to $190 million in international operating profit. The company plans to become the biggest toy seller in Japan. Also, the estimate of more than one billion children age 10 or younger in the United States, Europe, Latin America, and Asia encourages the growth of Toys "Я" Us. In the United States alone, the birth rate is above four million a year.[1]

The following steps use the Toys "Я" Us information to illustrate the general problem-solving procedure of companies that often results in a change in company policy:

Step 1.	State the problem(s).	Sales are down due to increased discounters' sales, loss of video sales, and less than expected foreign sales.
Step 2.	Decide the best method(s) to solve the problem(s).	Install in-store boutiques, such as Learning Centers, staffed with knowledgeable salespeople; make price cuts; offer promotions, personal-computer games, and outdoor play departments; and become Japan's leading toy seller.
Step 3.	Does the solution make sense?	Toys "Я" Us expects boutiques, price cuts, and promotions to regain discounter sales; personal-computer games to compete with arcades; and Japan's sales to increase foreign sales.
Step 4.	Evaluate results.	Has market share increased? Have company earnings increased? The potential market of children age 10 or younger encourages growth for Toys "Я" Us.

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[1] "Toys 'Я' Us Grows Up," *The Wall Street Journal*, March 20, 1995, p. B1.

As you can see, numbers are the foundation of business decision making. Your study of numbers begins with a review of the basic computation skills for speed and accuracy. You may think, "But I can use my calculator." Even if you use your calculator (your instructor may allow you to use it in class), you still must know the basic computation skills. Without these skills, you will not know what to calculate, how to interpret your calculations, how to use estimates to recognize an error you made in using your calculator, or how to make calculations when you do not have a calculator.

The United States uses the *decimal numbering system*, or *base 10 system*. In this measurement system, all units derived from the fundamental unit are multiples of 10.

Your calculator gives the 10 digits of the decimal system—0, 1, 2, 3, 4, 5, 6, 7, 8, 9. The center of the decimal system is the decimal point. *Whole numbers* are to the left of the decimal point; *decimal numbers* (discussed in Chapter 3) are to the right of the decimal point. This chapter discusses reading, writing, and rounding whole numbers; adding and subtracting whole numbers; and multiplying and dividing whole numbers.

LEARNING UNIT 1–1: READING, WRITING, AND ROUNDING WHOLE NUMBERS

We often use whole numbers in business calculations. For example, the Did You Know? in the chapter opener states that in a basketball season, Shaquille O'Neal earns about $30 million. This $30 million is a *whole number*. It also could be a *rounded whole number*.

Reading and Writing Whole Numbers

The decimal numbering system is a *place-value system*. The position, or placement, of the digits in a number gives the value of the digits. For example, in the number 745, the "7" means seven hundreds (700). In the number 75, the "7" means 7 tens (70).

To determine the value of each digit in a number, we use a place-value chart (Figure 1–1) that divides numbers into named groups of three digits each, with each group separated by commas. To separate a number into groups, you begin with the last digit and insert commas every three digits, moving from right to left. This divides the number into the named groups of three shown in the place-value chart. In Figure 1–1, the number 1,605,743,891,412 illustrates place values.

To read and write in verbal form the number in Figure 1–1, you begin at the left and read each group of three digits as if it were alone, adding the group name at the end (except the last units group). The number 1,605,743,891,412 is read as one trillion, six hundred five billion, seven hundred forty-three million, eight hundred ninety-one thousand, four hundred twelve. Note that you do not read zeros. They fill vacant spaces so that you can correctly state the number values. Also, the numbers twenty-one to ninety-nine must have a hyphen. And most important, when reading or writing whole numbers in verbal form, do not use the word *and*. In the decimal system, *and* indicates the decimal, which we discuss in Chapter 3.

When you study the place-value chart, you can see that the value of each place in the chart is 10 times the value of the place to the right. We can illustrate this by analyzing the last four digits in the number 1,605,743,891, 412:

$$1{,}412 = (1 \times 1{,}000) + (4 \times 100) + (1 \times 10) + (2 \times 1)$$

So far we have used the place-value chart to change a numeric number to a verbal number. You can also use the chart to reverse the procedure and change a verbal number to a numeric number.

FIGURE 1–1

Whole number place-value chart

Trillions				Billions				Millions				Thousands				Units		
Hundred trillions	Ten trillions	Trillions	Comma	Hundred billions	Ten billions	Billions	Comma	Hundred millions	Ten millions	Millions	Comma	Hundred thousands	Ten thousands	Thousands	Comma	Hundreds	Tens	Ones
	1	,	6	0	5	,	7	4	3	,	8	9	1	,	4	1	2

As you work with numbers, be careful to keep track of the place value of each digit. The place values of the digits in a number determine its total value.

Rounding Whole Numbers

Many of the whole numbers you read and hear are rounded numbers. Government statistics are usually rounded numbers. The financial reports of companies also use rounded numbers. All rounded numbers are *approximate* numbers. The more rounding you do, the more you approximate the number.

Rounded whole numbers are used for many reasons. With rounded whole numbers you can quickly estimate arithmetic results, check actual computations, report numbers that change quickly such as population numbers, and make numbers easier to read and remember.

Numbers can be rounded to an identified digit place value, or the identified digit can be the first digit of a number (rounding all the way). To round whole numbers, use the following three steps:

Rounding Whole Numbers

Step 1. Identify the place value of the digit you want to round.

Step 2. If the digit to the right of the identified digit in Step 1 is 5 or more, increase the identified digit by 1 (round up). If the digit to the right is less than 5, do not change the identified digit.

Step 3. Change all digits to the right of the rounded identified digit to zeros.

EXAMPLE 1   Round 9,362 to nearest hundred.

Step 1.   9,362   The digit 3 is in the hundreds place value.

Step 2.   Digit to the right of 3 is 5 or more (6). Thus, 3, the identified digit in Step 1, is now rounded to 4. You change the identified digit only if the digit to the right is 5 or more.

              9,462

Step 3.   9,400   Change digits 6 and 2 to zeros, since these digits are to the right of 4, the rounded number.

By rounding 9,362 to the nearest hundred, you can see that 9,362 is closer to 9,400 than 9,300.

EXAMPLE 2   Round 67,951 to nearest thousand.

Step 1.   67,951   The digit 7 is in the thousands place value.

Step 2.   Digit to the right of 7 is 5 or more (9). Thus, 7, the identified digit in Step 1, is now rounded to 8.

              68,951

Step 3.   68,000   Change digits 9, 5, and 1 to zeros, since these digits are to right of 8, the rounded number.

By rounding 67,951 to the nearest thousand, you can see that 67,951 is closer to 68,000 than 67,000.

Now let's look at **rounding all the way.** To round a number all the way, you round to the first digit of the number (the left-most digit) and have only one nonzero digit remaining in the number.

EXAMPLE 3   Round 7,843 all the way.

Step 1.   7,843   Identified left-most digit is 7.

Step 2.   Digit to the right of 7 is greater than 5 so 7 becomes 8.

              8,843

Step 3.   8,000   Change all other digits to zeros.

Rounding 7,843 all the way is 8,000.

Remember that rounding a digit to a specific place value depends on the degree of accuracy you want in your estimate. For example, 24,800 rounds all the way to 20,000 because the digit to the right of 2 is less than 5. This 20,000 is 4,800 less than the original 24,800. You would be more accurate if you rounded 24,800 to the place value of the identified digit 4, which is 25,000.

Before concluding this unit, let's look at how to dissect and solve a word problem.

How to Dissect and Solve a Word Problem

As a student, your author found solving word problems difficult. Not knowing where to begin after reading the word problem caused the difficulty. Today, students still struggle with word problems as they try to decide where to begin.

Solving word problems involves *organization* and *persistency*. Recall how persistent you were when you learned to ride a two-wheel bike. Do you remember the feeling of success you experienced when you rode the bike without help? Apply this persistency to word problems. Do not be discouraged. Each person learns at a different speed. Your goal must be to FINISH THE RACE and experience the success of solving word problems with ease.

To be organized in solving word problems, you need a plan of action that tells you where to begin—a blueprint aid. Like a builder, you will refer to this blueprint aid constantly until you know the procedure. The blueprint aid for dissecting and solving a word problem looks like this:

Blueprint Aid for Dissecting and Solving a Word Problem

The facts	Solving for?	Steps to take	Key points

Now let's study this blueprint aid. The first two columns require that you *read* the word problem slowly. Think of the third column as the basic information you must know or calculate before solving the word problem. Often this column contains formulas that provide the foundation for the step-by-step problem solution. The last column reinforces the key points you should remember.

It's time now to try your skill at using the blueprint aid for dissecting and solving a word problem.

The Word Problem On the 95th anniversary of Tootsie Roll Industries, the company reported sharply increased sales and profits. Sales reached one hundred ninety-four million dollars and a record profit of twenty-two million, five hundred fifty-six thousand dollars. The company president requested that you round the sales and profit figures all the way.

Study the following blueprint aid and note how we filled in the columns with the information in the word problem. You will find the organization of the blueprint aid most helpful. Be persistent! You *can* dissect and solve word problems! When you are finished with the word problem, make sure the answer seems reasonable.

The facts	Solving for?	Steps to take	Key points
Sales: One hundred ninety-four million dollars. *Profit:* Twenty-two million, five hundred fifty-six thousand dollars.	Sales and profit rounded all the way.	Express each verbal form in numeric form. Identify left-most digit in each number.	Rounding all the way means only the left-most digit will remain. All other digits become zeros.

Steps to solving problem

1. Convert verbal to numeric.
One hundred ninety-four million dollars ⟶ $194,000,000
Twenty-two million, five hundred fifty-six thousand dollars ⟶ $ 22,556,000

2. Identify left-most digit of each number.

$1 94,000,000 $2 2,556,000

3. Round.   ↓   ↓

<mark>$200,000,000</mark>   <mark>$20,000,000</mark>

Note that in the final answer, $200,000,000 and $20,000,000 have only one nonzero digit.

Remember that you cannot round numbers expressed in verbal form. You must convert these numbers to numeric form.

Now you should see the importance of the information in the third column of the blueprint aid. When you complete your blueprint aids for word problems, do not be concerned if the order of the information in your boxes does not follow the order given in the text boxes. Often you can dissect a word problem in more than one way.

LU 1–1 PRACTICE QUIZ

At the end of each learning unit, you can check your progress with a Practice Quiz. If you had difficulty understanding the unit, the Practice Quiz will help identify your area of weakness. Work the problems on scrap paper. Check your answers with the worked-out solutions that follow the quiz. Ask your instructor about specific assignments and the videotapes available for each chapter Practice Quiz. A complete set of drill and word problems follows this chapter (p. 19).

Appendix A at the end of the text contains additional drill and word problems for the learning units. In the inside back cover of the text is a page reference guide you can use to find the additional learning unit drill and word problems in Appendix A.

1. Write in verbal form:

   a. 7,948   **b.** 48,775   **c.** 814,410,335,414

2. Round the following numbers as indicated:

Nearest ten	**Nearest hundred**	**Nearest thousand**	**Rounded all the way**
a. 92	**b.** 745	**c.** 8,341	**d.** 4,752

3. Kellogg's reported its sales as five million, one hundred eight-one thousand dollars. The company earned a profit of five hundred two thousand dollars. What would the sales and profit be if each number were rounded all the way? (Hint: You might want to draw the blueprint aid since we show it in the solution.)

✔ **Solutions**

1. **a.** Seven thousand, nine hundred forty-eight

     b. Forty-eight thousand, seven hundred seventy-five

     c. Eight hundred fourteen billion, four hundred ten million, three hundred thirty-five thousand, four hundred fourteen

2. **a.** 92 = <mark>90</mark>   **b.** 745 = <mark>700</mark>   **c.** 8,341 = <mark>8,000</mark>   **d.** 4,752 = <mark>5,000</mark>

3. Kellogg's sales and profit:

The facts	**Solving for?**	**Steps to take**	**Key points**
Sales: Five million, one hundred eighty-one thousand dollars. *Profit:* Five hundred two thousand dollars.	Sales and profit rounded all the way.	Express each verbal form in numeric form. Identify left-most digit in each number.	Rounding all the way means only the left-most digit will remain. All other digits become zeros.

Steps to solving problem

1. Convert verbal to numeric.

    Five million, one hundred eighty-one thousand ⟶ $5,181,000

    Five hundred two thousand ⟶ $ 502,000

2. Identify left-most digit of each number.

    $5,181,000 $502,000

3. Round.   ↓   ↓

    <mark>$5,000,000</mark>   <mark>$500,000</mark>