SEVENTH EDITION

Contemporary Mathematics for Business and Consumers

BRIEF EDITION

ROBERT BRECHNER AND GEORGE BERGEMAN

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Contemporary Mathematics, 7e
Real Business. Real Math. Real Life.

Step into the Real Business World with the Strengths of Contemporary Mathematics, 7e. Each chapter is broken into individual performance objectives. The text guides you to mastery of each objective by way of a carefully designed learning system that includes these components:

An **EXPLANATION** of the topic

DETERMINING RATE OF INCREASE OR DECREASE

In calculating the rate of increase or decrease of something, we use the same percentage formula concepts as before. Rate of change means percent change; therefore, the *rate* is the unknown. Once again we use the formula $R = P \div B$. Rate of change situations contain an original amount of something, which either increases or decreases to a new amount.

In solving these problems, the original amount is always the base. The amount of change is the portion. The unknown, which describes the percent change between the two amounts, is the rate.

$$\textbf{Rate of change (Rate)} = \frac{\textbf{Amount of change (Portion)}}{\textbf{Original amount (Base)}}$$

A **STEP BOX** clearly describing the solution steps

STEPS FOR DETERMINING THE RATE OF INCREASE OR DECREASE

STEP 1. Identify the original and the new amounts and find the *difference* between them.

STEP 2. Using the rate formula $R = P \div B$, substitute the difference from Step 1 for the portion and the original amount for the base.

STEP 3. Solve the equation for R. Remember, your answer will be in decimal form, which must be converted to a percent.

EXAMPLE16 FINDING THE RATE OF CHANGE

Last year Iberia Furniture had a work force of 360 employees. This year there are 504 employees. What is the rate of change in the number of employees?

SOLUTIONSTRATEGY

The key to solving this problem is to properly identify the variables. The problem asks "what is the rate?"; therefore, the rate is the unknown. The original amount, 360 employees, is the base. The difference between the two amounts, $504 - 360 = 144$, is the portion. Now apply the rate formula.

$$R = \frac{P}{B} = \frac{144}{360} = .4 = 40\%$$

40% Increase in employees

An **EXAMPLE** with a complete step-by-step solution

TRYITEXERCISE 16

Solve the following problem for the rate of increase or decrease. Round to the nearest tenth of a percent when necessary.

When Mike Veteramo was promoted from supervisor to manager, he received a salary increase from $450 to $540 per week. What was the percent change in his salary?

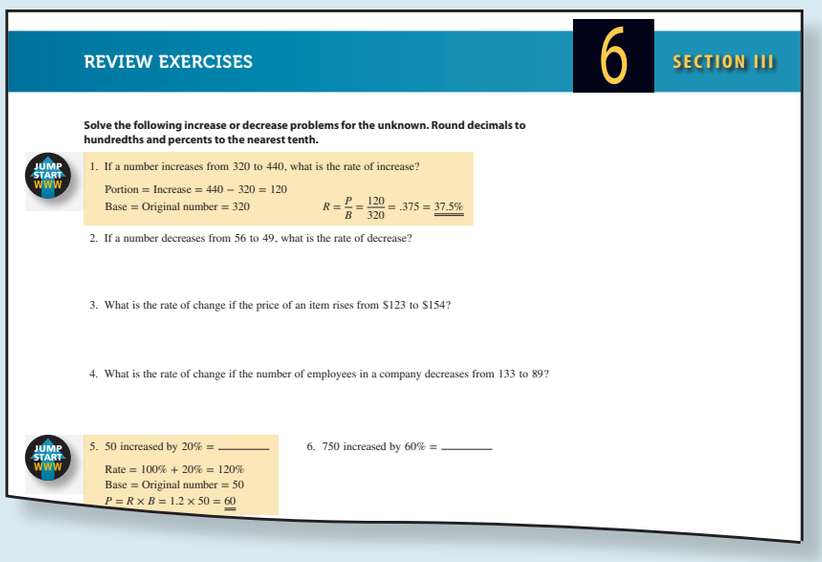
CHECK YOUR ANSWER WITH THE SOLUTION ON PAGE 182.

A **TRY-IT EXERCISE** with solution so you can immediately check your understanding and receive targeted help.

Additional Features Help You Succeed in Class and in the Real World

Answers to Odd-Numbered Review Exercises and Assessment Test Questions

(except Business Decisions) allow you to check your progress on assignments and homework.



REVIEW EXERCISES 6 SECTION III

Solve the following increase or decrease problems for the unknown. Round decimals to hundredths and percents to the nearest tenth.

1. If a number increases from 320 to 440, what is the rate of increase?

   Portion = Increase = 440 − 320 = 120
   Base = Original number = 320
   $R = \frac{P}{B} = \frac{120}{320} = .375 = 37.5\%$

2. If a number decreases from 56 to 49, what is the rate of decrease?

3. What is the rate of change if the price of an item rises from $123 to $154?

4. What is the rate of change if the number of employees in a company decreases from 133 to 89?

5. 50 increased by 20% = _____

   Rate = 100% + 20% = 120%
   Base = Original number = 50
   $P = R \times B = 1.2 \times 50 = 60$

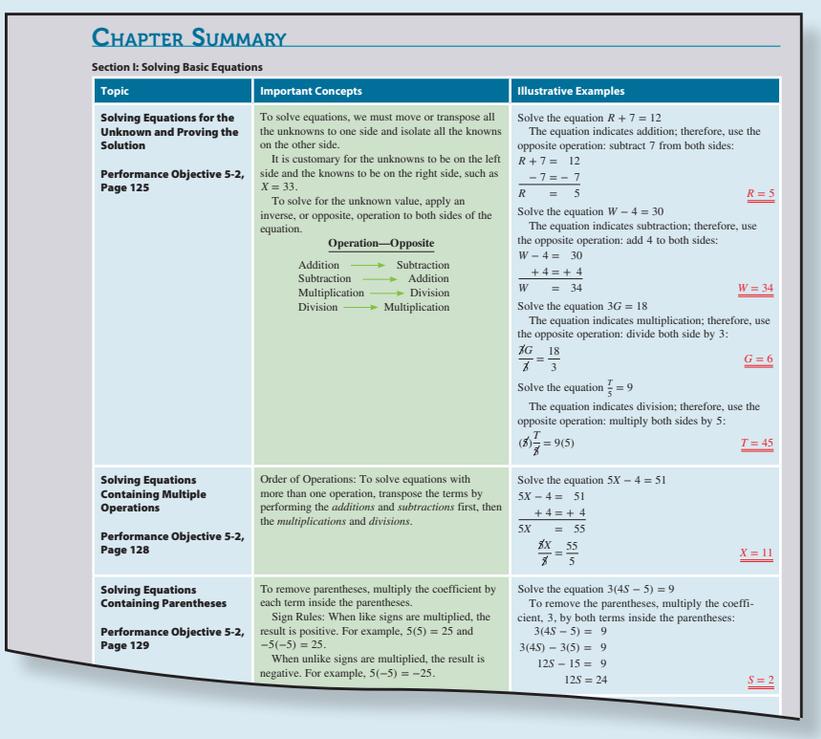
6. 750 increased by 60% = _____

Jump Start Solutions

Exercises in each Section Review give you the added advantage of seeing the worked-out solution to the first question of each new topic.

Business Decision

Exercises at the end of each section and each Assessment Test provide an opportunity for you to apply your knowledge in a realistic business situation.



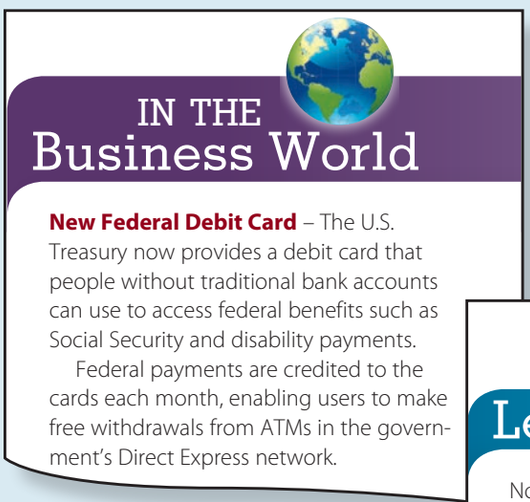
CHAPTER SUMMARY

Section I: Solving Basic Equations

Topic	Important Concepts	Illustrative Examples
Solving Equations for the Unknown and Proving the Solution **Performance Objective 5-2, Page 125**	To solve equations, we must move or transpose all the unknowns to one side and isolate all the knowns on the other side. It is customary for the unknowns to be on the left side and the knowns to be on the right side, such as $X = 33$. To solve for the unknown value, apply an inverse, or opposite, operation to both sides of the equation. **Operation—Opposite** Addition → Subtraction Subtraction → Addition Multiplication → Division Division → Multiplication	Solve the equation $R + 7 = 12$ The equation indicates addition; therefore, use the opposite operation: subtract 7 from both sides: $R + 7 = 12$ $-7 = -7$ $R = 5$ $R = 5$ Solve the equation $W - 4 = 30$ The equation indicates subtraction; therefore, use the opposite operation: add 4 to both sides: $W - 4 = 30$ $+4 = +4$ $W = 34$ $W = 34$ Solve the equation $3G = 18$ The equation indicates multiplication; therefore, use the opposite operation: divide both side by 3: $\frac{3G}{3} = \frac{18}{3}$ $G = 6$ Solve the equation $\frac{T}{5} = 9$ The equation indicates division; therefore, use the opposite operation: multiply both sides by 5: $(5)\frac{T}{5} = 9(5)$ $T = 45$
Solving Equations Containing Multiple Operations **Performance Objective 5-2, Page 128**	Order of Operations: To solve equations with more than one operation, transpose the terms by performing the *additions* and *subtractions* first, then the *multiplications* and *divisions*.	Solve the equation $5X - 4 = 51$ $5X - 4 = 51$ $+4 = +4$ $5X = 55$ $\frac{5X}{5} = \frac{55}{5}$ $X = 11$
Solving Equations Containing Parentheses **Performance Objective 5-2, Page 129**	To remove parentheses, multiply the coefficient by each term inside the parentheses. Sign Rules: When like signs are multiplied, the result is positive. For example, $5(5) = 25$ and $-5(-5) = 25$. When unlike signs are multiplied, the result is negative. For example, $5(-5) = -25$.	Solve the equation $3(4S - 5) = 9$ To remove the parentheses, multiply the coefficient, 3, by both terms inside the parentheses: $3(4S - 5) = 9$ $3(4S) - 3(5) = 9$ $12S - 15 = 9$ $12S = 24$ $S = 2$

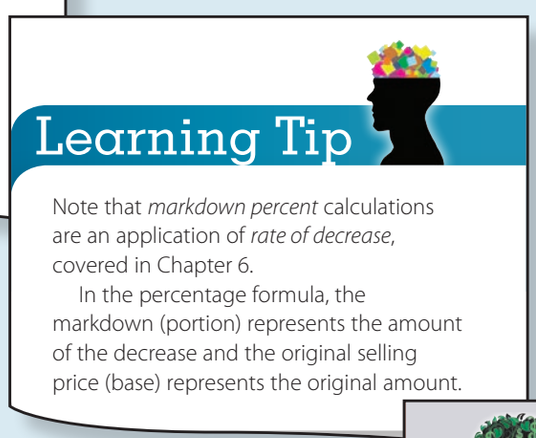
Chapter Summary Charts

Offer a comprehensive, concise review of each performance objective and emphasize important chapter concepts. Page references, solution step, formulas, and examples with worked-out solutions provide an invaluable reference for you when reviewing or studying for an exam.



In The Business World

Useful and interesting connections to the real business world. Many have useful information to help you manage your own personal finances.

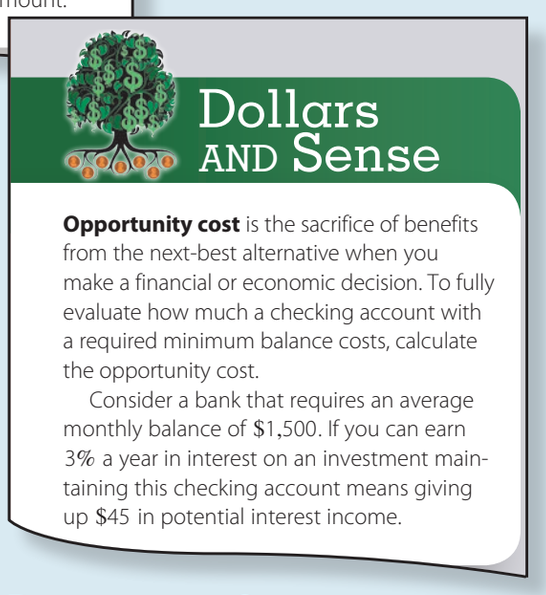


Learning Tips

Helpful mathematical hints, shortcuts, and reminders to enhance your understanding of the chapter material.

Formula Recap Charts

Lists of all-important formulas provide you with a quick reference for homework and test preparation.



Business Math Journal

Appearing every three chapters beginning with Chapter 3, a page of current news items, cartoons, brain teasers, famous business and inspirational quotes, career information, and other interesting facts and figures related to business topics.

Dollars and Sense

This feature stimulates your curiosity with current news items and statistics related to chapter topics. "Dollars and Sense" provides you with numerous personal finance and business money tips.

Supplemental Tools for Students

- **Jump Start Solutions** provide worked-out solutions to the first question in each new topic set in the section exercises.
- **Excel® Templates** corresponding to problems in the text are presented at three levels of difficulty.
- **Excel® Guide and Workbook** helps you learn spreadsheet basics.
- **BizMath Videos** focus on core topics in business math. They utilize three methods of learning: Define, Demonstrate, and Do. Each segment focuses on a core topic to help you master the critical skills necessary for achieving success in your business math course.
- **Financial Calculator Guide and Workbook** provides keystroke-by-keystroke instruction on using a business calculator.

Access these tools by going to **www.cengagebrain.com**. Enter "**Brechner**" in the search box and select the appropriate text. Click the "**Free Materials**" tab, and then click "**Access Now**."

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Every one of the more than 15,000 MathCue homework and test questions is accompanied by a complete step-by-step solution to help you pinpoint and correct areas of weakness. You can perform your own error analysis to help you successfully master business math topics. (The timing and availability of solutions are controlled by your instructor.) Additional exercises without solutions are also included in this package.

Acknowledgments

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I also wish to convey my love and thanks to my daughter, Jessy Bergeman, for her assistance with the development of MathCue.Business to accompany each of the past editions as well as her help with various aspects of the current edition of the text itself.

On the following page is a remembrance of Bob Brechner who worked tirelessly to develop this text. He was both a friend and a colleague and is deeply missed. I very much appreciate my good fortune in having had the opportunity to collaborate with him for more than sixteen years. I am also grateful to have the continuing support and friendship of Bob's wife, Shari Brechner, who has positively impacted this text from its very first edition.

Finally, I wish to express my love and gratitude to my wife, Clarissa. She has provided encouragement and support over many years, and I offer her my heartfelt thanks.

George Bergeman
October, 2013

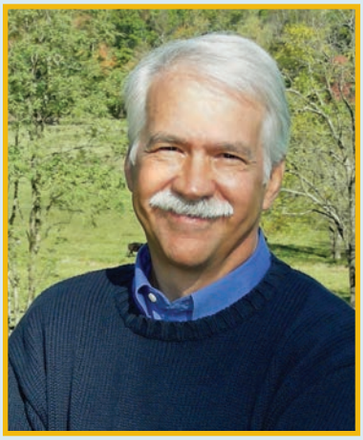

Photo by Clarissa Bergeman

George Bergeman

George Bergeman's teaching career of over twenty-five years began at a small college in West Africa as a Peace Corps Volunteer and continued at Northern Virginia Community College, one of the largest multi-campus colleges in the country. Teaching awards included Faculty Member of the Year honors at his campus.

George is the author of numerous packages developed to provide targeted and effective support for instruction. His first package was a statistics software/workbook combination published in 1985, and since then he has developed a variety of software packages to support statistics, calculus, developmental math, and finite math including math of finance. MathCue.Business in conjunction with *Contemporary Mathematics for Business and Consumers* has been a focal point for George for more than sixteen years. During that time, he worked closely with Bob Brechner to develop and refine the package and now serves as coauthor for the seventh edition of the text.

George lives with his wife, Clarissa, near Washington, D.C. Their daughter, Jessy, recently completed grad school in Colorado after previously working in San Francisco, Boston, and Brazil. In his free time, George enjoys accompanying his wife and their young corgi, Simon, on walks and to training sessions in preparation for dog shows. Other hobbies include photography and videography, and these activities frequently intersect with dog training and dog shows. Along those lines, George and his wife produced a dog-sport training video which has been distributed throughout the United States and several other countries.

Remembering Robert Brechner ...

Photo by Shari Brechner

The textbook you're now reading in its seventh edition is possible due to six editions fueled by the creative energy and hard work of Bob Brechner. From the first, Bob had a clear idea of what students need and an exceedingly strong desire to carefully develop and then rework each and every element in this text until it could meet that need. All of Bob's efforts were directed toward giving students the absolute best chance to succeed, and he wanted to collaborate with instructors to provide a life changing experience for students. In fact, that was a large part of his motivation – to have the experience of learning mathematics and business leveraged to provide skills and confidence to meet the challenges beyond the campus environment.

Bob was Professor Emeritus, School of Business, at Miami-Dade College, the largest multi-campus community college in the country. During his 42 years at the College, he taught Business Math, Principles of Business, Marketing, Advertising, Public Relations, Management, and Personal Finance. Bob also served as Adjunct Professor at Florida Atlantic University, Boca Raton; International Fine Arts College, Miami; and Florida International University School of Journalism and Mass Communications.

Bob received a Bachelor of Science degree in Industrial Management from the Georgia Institute of Technology and a Masters of Business Administration from Emory University. He also consulted widely with industrial companies and published numerous books covering a variety of business topics.

Beginning with the first edition of this text, I was fortunate to have had the opportunity to work with Bob to help in this project. I clearly remember the call from Bob in which he outlined his vision and asked if I would develop software to complement the text. It was evident that Bob was tuned into the needs of both students and instructors, and I readily agreed.

Working with Bob was as fun as it was satisfying, and, with spouses included, we become great friends. As a result, our phone conversations managed to take many detours through photography, sports, family, friends, and the like. As enjoyable as these discussions were, it was a particular treat to share his pleasure in talking about instruction with faculty in person or via online webcasts.

Over the years I learned that Bob's approach to writing and instruction was in many ways a reflection of his approach to life in general. In all cases he had a 100% positive attitude coupled with a go-for-it mentality that made both his writing and the way he lived his life remarkable.

All of those who knew Bob were not the least surprised to discover he faced cancer with strength and a consistently positive outlook. With his wife, Shari Joy, providing support as always, he fought courageously and with exceptionally good humor for far longer than medical personnel had reason to expect.

Just as his approach to life and writing were intertwined, he is remembered with fondness and admiration by overlapping sets of friends and academic associates. In truth, it wasn't possible to be an associate and not also be friend, and that, in itself, is a wonderful part of his legacy.

George Bergeman
October, 2013

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Whole Numbers

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SECTION I

1 The Decimal Number System: Whole Numbers

Numbers are one of the primary tools used in business. The ability to read, comprehend, and manipulate numbers is an essential part of the everyday activity in today's complex business world. To be successful, business students should become competent and confident in dealing with numbers.

We will begin our study of business mathematics with whole numbers and their basic operations—addition, subtraction, multiplication, and division. The material in this chapter is based on the assumption that you have a basic working knowledge of these operations. Our goal is to review these fundamentals and build accuracy and speed. This arithmetic review will set the groundwork for our study of fractions, decimals, and percentages. Most business math applications involve calculations using these components.

1-1 Reading and Writing Whole Numbers in Numerical and Word Form

decimal number system A system using the 10 Hindu-Arabic symbols 0 through 9. In this place value system, the position of a digit to the left or right of the decimal point affects its value.

decimal point A dot written in a decimal number to indicate where the place values change from whole numbers to decimals.

The number system most widely used in the world today is known as the Hindu-Arabic numeral system, or **decimal number system**. This system is far superior to any other for today's complex business calculations. It derives its name from the Latin words *decimus*, meaning 10th, and *decem*, meaning 10. The decimal system is based on 10s, with the starting point marked by a dot known as the **decimal point**. The decimal system uses the 10 familiar Hindu-Arabic symbols or digits:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

The major advantage of our decimal system over previous systems is that the position of a digit to the left or right of the decimal point affects its value. This enables us to write any number with only the 10 single-digit numbers, 0 through 9. For this reason, we have given names to the places or positions. In this chapter, we work with places to the left of the decimal point, **whole numbers**. The next two chapters are concerned with the places to the right of the decimal point, fractions, and decimals.

whole numbers Any numbers 0 or greater that do not contain a decimal or fraction. Whole numbers are found to the left of the decimal point. Also known as an integer. For example, 6, 25, and 300 are whole numbers.

When whole numbers are written, a decimal point is understood to be located on the right of the number. For example, the number **27** is actually

27.

The decimal point is not displayed until we write a decimal number or dollars and cents, such as 27.25 inches or $27.25.

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Skills you acquire in this course will be applied frequently in your roles as a consumer and a businessperson.

Exhibit 1-1 illustrates the first 15 places, and five groups, of the decimal number system. Note that our system is made up of groups of three places, separated by commas, each with its own name. Whole numbers start at the understood decimal point and increase in value from right to left. Each group contains the same three places: ones, tens, and hundreds. Note that each place increases by a factor of "times 10." The group names are units, thousands, millions, billions, and trillions.

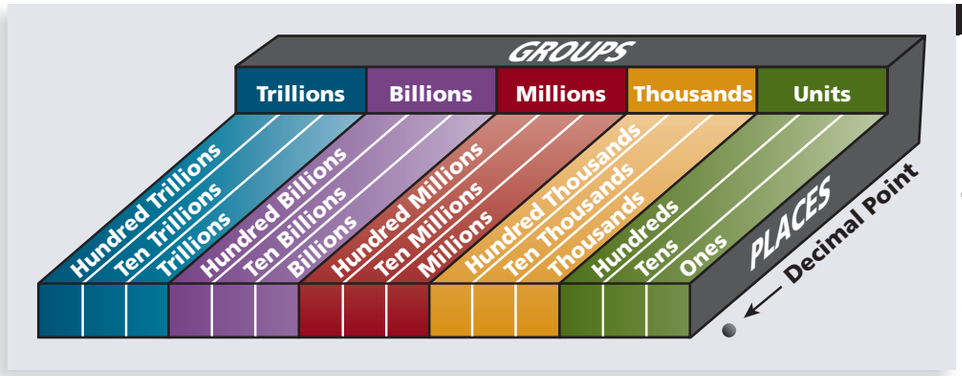


EXHIBIT 1-1
Whole Number Place Value Chart

STEPS FOR READING AND WRITING WHOLE NUMBERS

STEP 1. Beginning at the right side of the number, insert a comma after every three digits to mark the groups.

STEP 2. Beginning from left to right, name the digits and the groups. The units group and groups that have all zeros are not named.

STEP 3. When writing whole numbers in word form, the numbers from 21 to 99 are hyphenated, except for the decades (e.g., thirty). For example, 83 would be written as eighty-three.

Note: The word *and* should *not* be used in reading or writing whole numbers. It represents the decimal point and will be covered in Chapter 3.

Learning Tip

Whole numbers with four digits may be written with or without a comma. For example, 3,400 or 3400 are both correct.

EXAMPLE 1 READING AND WRITING WHOLE NUMBERS

Read and write the following whole numbers in numerical and word form.

a. 14296
b. 560
c. 2294857
d. 184910
e. 3004959001
f. 24000064

SOLUTION STRATEGY

Following the steps above, we insert the commas to mark the groups, then read and write the numbers from left to right.

	Number	Numerical Form	Word Form
a.	14296	14,296	fourteen thousand, two hundred ninety-six
b.	560	560	five hundred sixty
c.	2294857	2,294,857	two million, two hundred ninety-four thousand, eight hundred fifty-seven
d.	184910	184,910	one hundred eighty-four thousand, nine hundred ten
e.	3004959001	3,004,959,001	three billion, four million, nine hundred fifty-nine thousand, one
f.	24000064	24,000,064	twenty-four million, sixty-four

IN THE Business World

In text, large numbers, in the millions and greater, may be easier to read by writing the "zeros portion" in words. For example, 44,000,000,000,000 may be written as 44 trillion.

TRYITEXERCISE 1

Read and write the following whole numbers in numerical and word form.

a. 49588 b. 804 c. 1928837

d. 900015 e. 6847365911 f. 2000300007

CHECK YOUR ANSWERS WITH THE SOLUTIONS ON PAGE 24.

1-2 Rounding Whole Numbers to a Specified Place Value

rounded numbers Numbers that are approximations or estimates of exact numbers. For example, 50 is the rounded number of the exact number 49.

estimate To calculate approximately the amount or value of something. The number 50 is an estimate of 49.

rounding all the way A process of rounding numbers to the first (i.e., the leftmost) digit. Used to prework a problem to an estimated answer. For example, 2,865 rounded all the way is 3,000.

In many business applications, the use of an approximation of an exact number may be more desirable than using the number itself. Approximations, or **rounded numbers**, are easier to refer to and remember. For example, if a grocery store carries 9,858 items on its shelves, you would probably say that it carries 10,000 items. If you drive 1,593 miles, you would say that the trip is 1,600 miles. Another rounding application in business involves money. If your company has profits of $1,302,201, you might refer to this exact amount by the rounded number $1,300,000. Money amounts are usually rounded to the nearest cent, although they could also be rounded to the nearest dollar.

Rounded numbers are frequently used to **estimate** an answer to a problem before that problem is worked. Estimation approximates the exact answer. By knowing an estimate of an answer in advance, you will be able to catch many math errors. When using estimation to prework a problem, you can generally round off to the first (i.e., the leftmost) digit, which is called **rounding all the way**.

Once you have rounded to the first digit, perform the indicated math procedure. This can often be done quickly and will give you a ballpark or general idea of the actual answer. In the example below, the estimated answer of 26,000 is a good indicator of the "reasonableness" of the actual answer.

Original Calculation	Estimated Solution (rounding all the way)	Actual Solution
19,549	20,000	19,549
+ 6,489	+ 6,000	+ 6,489
	26,000	26,038

If, for example, you had mistakenly added for a total of 23,038 instead of 26,038, your estimate would have immediately indicated that something was wrong.

STEPS FOR ROUNDING WHOLE NUMBERS TO A SPECIFIED PLACE VALUE

STEP 1. Determine the place to which the number is to be rounded.

STEP 2a. If the digit to the right of the place being rounded is 5 or more, increase the digit in that place by 1.

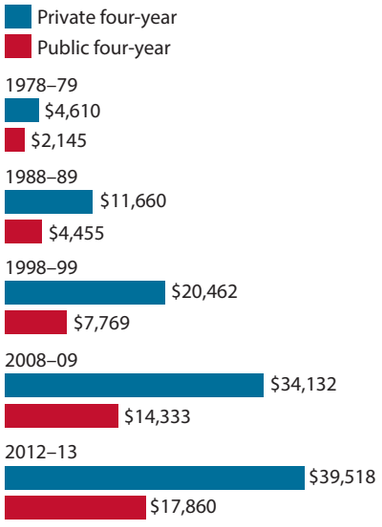
STEP 2b. If the digit to the right of the place being rounded is 4 or less, do not change the digit in the place being rounded.

STEP 3. Change all digits to the right of the place being rounded to zeros.

Dollars AND Sense

Pricey Diplomas

In the past three decades, college costs[1] have increased more than sevenfold at private schools and sixfold at public ones.



1. Figures include tuition, fees, and room and board and are not adjusted for inflation.

Source: *The College Board*

EXAMPLE 2 ROUNDING WHOLE NUMBERS

Round the following numbers to the indicated place.

a. 1,867 to tens
b. 760 to hundreds
c. 129,338 to thousands
d. 293,847 to hundred thousands
e. 97,078,838,576 to billions
f. 85,600,061 all the way

SOLUTION STRATEGY

Following the steps on page 4, locate the place to be rounded, use the digit to the right of that place to determine whether to round up or leave it as is, and change all digits to the right of the place being rounded to zeros.

		Place Indicated	Rounded Number
a.	1,867 to tens	1,867	1,870
b.	760 to hundreds	760	800
c.	129,338 to thousands	129,338	129,000
d.	293,847 to hundred thousands	293,847	300,000
e.	97,078,838,576 to billions	97,078,838,576	97,000,000,000
f.	85,600,061 all the way	85,600,061	90,000,000

TRY IT EXERCISE 2

Round the following numbers to the indicated place.

a. 51,667 to hundreds
b. 23,441 to tens
c. 175,445,980 to ten thousands
d. 59,561 all the way
e. 14,657,000,138 to billions
f. 8,009,070,436 to ten millions

CHECK YOUR ANSWERS WITH THE SOLUTIONS ON PAGE 24.

REVIEW EXERCISES

1 SECTION I

Read and write the following whole numbers in numerical and word form.

	Number	Numerical Form	Word Form
1.	22938	22,938	Twenty-two thousand, nine hundred thirty-eight
2.	1573		
3.	184		
4.	984773		
5.	2433590		
6.	49081472		

Write the following whole numbers in numerical form.

7. One hundred eighty-three thousand, six hundred twenty-two 183,622
8. Two million, forty-three thousand, twelve _____
9. According to Globo's G1 website, expenses in preparation for the 2014 World Cup in Brazil reached forty billion dollars. Write this number in numerical form. _____

Match the following numbers in word form with the numbers in numerical form.

10. One hundred two thousand, four hundred seventy __b__
11. One hundred twelve thousand, seven hundred forty-three _____
12. Twelve thousand, seven hundred forty-three _____
13. Eleven thousand, two hundred seventy _____
14. According to NCR Corporation, retailers in America generate 228,700,000 pounds of paper receipts per year. Write this number in word form.

a. 12,743
b. 102,470
c. 11,270
d. 112,743

Round the following numbers to the indicated place.

15. 1,757 to tens 1,760
16. 32,475 to thousands _____
17. 235,376 to hundreds _____
18. 559,443 to ten thousands _____
19. 8,488,710 to millions _____
20. 45,699 all the way _____
21. 1,325,669,226 to hundred millions _____
22. 23,755 all the way _____
23. According to the American Wind Energy Association, Texas has the highest operating wind capacity, 8,797 megawatts. Iowa is second with 3,053 megawatts capacity.
    a. Write each of these numbers in word form.
    b. Round each of these numbers to the nearest hundred.
24. According to the *Financial Times*, in a recent recession, outstanding consumer credit in the United States fell to $2,460,000,000,000—the seventh straight monthly decline. Most of the drop came as a result of consumers paying down revolving debt such as credit cards.
    a. Write this number in word form.
    b. Round this number to the nearest hundred billion.

BUSINESS DECISION: UP OR DOWN?

25. You are responsible for writing a monthly stockholders' report about your company. Your boss has given you the flexibility to round the numbers to tens, hundreds, thousands, and so on, or not at all, depending on which is most beneficial for the company's image. For each of the following monthly figures, make a rounding choice and explain your reasoning.
    a. 74,469—number of items manufactured _____
    b. $244,833—your department's net sales for the month _____
    c. 5,648—defective items manufactured _____
    d. $649,341—total company profit _____
    e. 149 new customers _____

ADDITION AND SUBTRACTION OF WHOLE NUMBERS

1 SECTION II

Addition and subtraction are the most basic mathematical operations. They are used in almost all business calculations. In business, amounts of things or dollars are often combined or added to determine the total. Likewise, subtraction is frequently used to determine an amount of something after it has been reduced in quantity.

ADDING WHOLE NUMBERS AND VERIFYING YOUR ANSWERS

1-3

Addition is the mathematical process of computing sets of numbers to find their sum, or total. The numbers being added are known as **addends**, and the result or answer of the addition is known as the **sum**, **total**, or **amount**. The "+" symbol represents addition and is called the **plus sign**.

addition The mathematical process of computing sets of numbers to find their sum, or total.

addends Any of a set of numbers being added in an addition problem. For example, 4 and 1 are the addends of the addition problem 4 + 1 = 5.

sum, total, or amount The result or answer of an addition problem. The number 5 is the sum, or total, of 4 + 1 = 5.

plus sign The symbol "+" representing addition.

$$\begin{array}{rl} 1{,}932 & \text{addend} \\ 2{,}928 & \text{addend} \\ +\ 6{,}857 & \text{addend} \\ \hline 11{,}717 & \text{total} \end{array}$$

STEPS FOR ADDING WHOLE NUMBERS

STEP 1. Write the whole numbers in columns so that you line up the place values—units, tens, hundreds, thousands, and so on.

STEP 2. Add the digits in each column, starting on the right with the units column.

STEP 3. When the total in a column is greater than nine, write the units digit and carry the tens digit to the top of the next column to the left.

VERIFYING ADDITION

Generally, when adding the digits in each column, we add from top to bottom. An easy and commonly used method of verifying your addition is to add the numbers again, but this time from bottom to top. By adding the digits in the *reverse* order, you will reduce the chance of making the same error twice.

For illustrative purposes, addition verification will be rewritten in reverse. In actuality, you do not have to rewrite the numbers; just add them from bottom to top. As mentioned earlier, you will achieve speed and accuracy with practice.

Learning Tip

Once you become proficient at verifying addition, you can speed up your addition by recognizing and combining two numbers that add up to 10, such as 1 + 9, 2 + 8, 6 + 4, and 5 + 5. After you have mastered combining two numbers, try combining three numbers that add up to 10, such as 3 + 3 + 4, 2 + 5 + 3, and 4 + 4 + 2.

Addition	Verification
8	6
3	3
+ 6	+ 8
17	17

A WORD ABOUT WORD PROBLEMS

In business math, calculations are only a part of the story! Most importantly, business math requires the ability to (1) understand and analyze the facts of business situations, (2) determine what information is given and what is missing, (3) decide what strategy and procedure is required to solve for an answer, and (4) verify your answer. Business application word problems are an important part of each chapter's subject matter. As you progress through the course, your ability to analyze and solve these business situations will improve. Now start slowly and relax!

EXAMPLE 3 ADDING WHOLE NUMBERS

Add the following sets of whole numbers. Verify your answers by adding in reverse.

a. 40,562
29,381
+ 60,095

b. 2,293 + 121 + 7,706 + 20 + 57,293 + 4

c. Galaxy Industries, a furniture manufacturing company, has 229 employees in the design and cutting department, 439 employees in the assembly department, and 360 employees in the finishing department. There are 57 warehouse workers, 23 salespeople, 4 bookkeepers, 12 secretaries, and 5 executives. How many people work for this company?

SOLUTION STRATEGY

a.

40,562
29,381
+ 60,095
130,038

Verification:

60,095
29,381
+ 40,562
130,038

Step 1. Write the numbers in columns so that the place values line up. In this example, they are already lined up.

Step 2. Add the digits in each column, starting with the units column.

Units column: 2 + 1 + 5 = 8 Enter the 8 under the units column.

Tens column: 6 + 8 + 9 = 23 Enter the 3 under the tens column and carry the 2 to the hundreds column.

Hundreds column: 2 + 5 + 3 + 0 = 10 Enter the 0 under the hundreds column and carry the 1 to the thousands column.

Thousands column: 1 + 0 + 9 + 0 = 10 Enter the 0 under the thousands column and carry the 1 to the ten thousands column.

Ten thousands column: 1 + 4 + 2 + 6 = 13 Enter the 3 under the ten thousands column and the 1 under the hundred thousands column.

b.

Addition	Verification
2,293	4
121	57,293
7,706	20
20	7,706
57,293	121
+ 4	+ 2,293
67,437	67,437

c.

Addition	Verification
229	5
439	12
360	4
57	23
23	57
4	360
12	439
+ 5	+ 229
1,129	1,129

IN THE Business World

Basic math proficiency without calculators is important. Calculators are not permitted on most employment tests and Civil Service exams.

TRY IT EXERCISE 3

Add the following sets of whole numbers and verify your answers.

a.
$$\begin{array}{r} 39{,}481 \\ 5{,}594 \\ +\ 11{,}029 \\ \hline \end{array}$$

b. 6,948 + 330 + 7,946 + 89 + 5,583,991 + 7 + 18,606

c. Anthony's Italian Restaurant served 183 meals on Monday, 228 meals on Tuesday, 281 meals on Wednesday, 545 meals on Thursday, and 438 meals on Friday. On the weekend, it served 1,157 meals. How many total meals were served that week?

CHECK YOUR ANSWERS WITH THE SOLUTIONS ON PAGE 24.

SUBTRACTING WHOLE NUMBERS AND VERIFYING YOUR ANSWERS

1-4

Subtraction is the mathematical computation of taking away, or deducting, an amount from a given number. Subtraction is the opposite of addition. The original or top number is the **minuend**; the amount we are subtracting from the original number is the **subtrahend**; and the answer is the **remainder**, or **difference**. The "−" symbol represents subtraction and is called the **minus sign**.

$$\begin{array}{rl} 2{,}495 & \text{minuend} \\ -\ \ 320 & \text{subtrahend} \\ \hline 2{,}175 & \text{difference} \end{array}$$

subtraction The mathematical process of taking away, or deducting, an amount from a given number.

minuend In subtraction, the original number. The amount from which another number, the subtrahend, is subtracted. For example, 5 is the minuend of the subtraction problem 5 − 1 = 4.

subtrahend The amount being taken or subtracted from the minuend. For example, 1 is the subtrahend of 5 − 1 = 4.

difference or remainder The number obtained when one number is subtracted from another. The answer or result of subtraction. For example, 4 is the difference or remainder of 5 − 1 = 4.

minus sign The symbol "−" representing subtraction.

STEPS FOR SUBTRACTING WHOLE NUMBERS

STEP 1. Write the whole numbers in columns so that the place values line up.

STEP 2. Starting with the units column, subtract the digits.

STEP 3. When a column cannot be subtracted, you must "borrow" a digit from the column to the left of the one you are working in.

VERIFYING SUBTRACTION

An easy and well-known method of verifying subtraction is to add the difference and the subtrahend. If you subtracted correctly, this total will equal the minuend.

Subtraction		Verification	
200	minuend	150	difference
− 50	subtrahend	+ 50	subtrahend
150	difference	200	minuend

EXAMPLE 4 SUBTRACTING WHOLE NUMBERS

Subtract the following whole numbers and verify your answers.

a.
$$\begin{array}{r} 4{,}968 \\ -\ 192 \\ \hline \end{array}$$

b. 189,440 − 1,347

c. On Monday morning, Appliance Depot had 165 microwave ovens in inventory. During the week, the store had a clearance sale and sold 71 of the ovens. How many ovens remain in stock for next week?