

# **BUSINESS MATH**

WITH

# ELECTRONIC ACCURACY



**RONALD MERCHANT**

# **BUSINESS MATH WITH ELECTRONIC ACCURACY**

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# PREFACE

Almost one-third of the adult population is functionally incompetent at computation according to a recent article in U.S. News and World Report. Apparently even this high figure is growing because only 39 percent of the 17-year olds, in a recent nationwide survey, could correctly divide 250 by 0.5. The U.S. News article says the key reason for these problems is: "Today's math curriculum is out of date, dull . . . Math classes haven't caught up with calculators and computers." The American Mathematics Association, in their goals for the 1980's, states that calculators should be used to teach number skills. The Association Of Independent Colleges and Schools president, Stephen B. Friedheim, in a speech to the Southern Business Education Association, said that every business student must have computational skills to be a productive business employee. Certainly, a lack of number skills filters people from many rewarding business occupations.

We in business education do not need to eliminate students diagnosed with math deficiencies or "math anxiety" from our programs; nor do we need to send these students with math deficiencies to special developmental centers, where they are forced to reduce fractions, find lowest common denominators, compute the volume of a sphere, and other operations unrelated to business or the students' interest.

Business math instructors have a special advantage in teaching number skills. Using business examples can make numbers relevant and meaningful in the lives of our students. It is not difficult to show students that if they are to achieve in the business world they must be able to get facts from the figures they encounter. They must be able to make sound decisions based on quantitative data in the form of balance sheets, income statements, budgets, sales records, etc.

This book was written with these ideas in mind. Those students with "math anxiety," as well as those with strong backgrounds in algebra or calculus, should have a basic proficiency with numbers that are applicable to business. Students should be able to add, subtract, multiply, divide, and estimate without the aid of a calculator; they should be aware of the special features found on most calculators; and they should be able to "think metric." This text meets students where they are. Students WITHOUT basic skills have materials designed to meet their needs. Students WITH basic number skills can be branched around what they already know.

During the past six years I have had the opportunity to give more than sixty presentations on the importance of business math at business and vocational educational conferences throughout the United States. Teachers have asked me to write a book that did not require the use of a business **DESK** calculator.

This is that book. **BASIC BUSINESS MATH AND ELECTRONIC CALCULATORS** is now the most popular textbook in America for use in a combined business math and business calculator course. It has been thoroughly tested and revised over a period of more than ten years and is now in its third edition. It contains input from thousands of students and many teachers.

The concept "IF IT IS NOT BROKEN DON'T FIX IT," was used in writing **BUSINESS MATH WITH ELECTRONIC ACCURACY**. We have kept the appropriate features in our combined book, eliminated those sections dealing with a desk type calculator and added sections on ratios, index numbers, financial analysis, and time value concepts. **BUSINESS MATH WITH ELECTRONIC ACCURACY** is useful and meaningful for all business students especially those in accounting and economics.

# TO THE STUDENT

This text is meant to help you improve your number skills. The use of calculators will help simplify and remove the drudgery from many business math problems. If you like working with numbers and already have some number skills, you will enjoy using this book. Since the book branches you around subject matter you already know, you will find the material more challenging and will be able to use your time more efficiently. For those of you who have some “math anxiety,” you need to give yourself one more chance. Anxiety about mathematics is often the result, not the cause, of negative experiences with it. Everyone has the potential for success with numbers and everyone should have the opportunity to experience the pleasure and power that competence with numbers can provide. Number skills will benefit you in other classes, in a business career, and even in the everyday business of living.

The arithmetic section of this book makes a stimulating refresher course for those already skilled in arithmetic. It also will help beginners build fundamental skills with fractions, decimals, and percents. Even in the areas of addition, subtraction, multiplication, and division, this section offers a stimulating review and some novel methods for estimating answers, increasing speed, and improving accuracy. Four of the tests are meant to be taken **WITHOUT** the aid of a calculator.

Nowadays we find calculators not only in many homes, but in almost all businesses. In fact a calculator is the most common **HIGH TECH** tool found in business today. As a business student you should become proficient on a calculator and gain awareness of just what these inexpensive tools can do for you. Employers have come to expect such skill and knowledge.

This text does not assume, however, that calculators have eliminated altogether the need for basic arithmetic skills. Rather, it assumes that the calculator is truly a learning tool, which, along with a knowledge of basic mathematics will help you solve complex real-life problems without becoming bogged down in time-consuming calculations. Skill with a calculator will not only give beginning students more confidence in tackling difficult problems, but it will allow those of you who are more advanced the time to probe deeper into meanings and relationships.

Today’s calculators are easy to operate, yet most people learn to use them only as an electronic scratch pad. They are so concerned with getting an answer to a specified problem that they avoid even such simple calculator features as memory, constants, and chain functions. It takes a concentrated effort to fully utilize even the most simple capabilities found on most calculators. This course offers you the opportunity to concentrate on using a calculator efficiently.

You need not think like a mathematician to use the tools and language of business mathematics. You can best learn the tools and develop skill with a calculator, not through abstract numbers, theorems, rules, and proofs but by association with everyday experience and general knowledge.

Using the format of this book you will be an active learner, not just a passive reader. As an active self-directed learner you will achieve more, retain more, and learn 20 to 50 percent faster.

This course will enable you to:

- Work with numbers and solve business problems.

- Estimate answers and thereby improve your accuracy and self-confidence.

- Solve word problems.

- Use the special features found on most modern calculators.

- “Think metric.”

Students like the self-directed format. They also like the idea of combining math with the use of calculators.

This book follows international metric standards and the practice of most calculator manufacturers of spacing numbers in groups of three without commas.

I wish to thank the many faculty and students who contributed to this text, especially Virginia Brannan, Russ Denniston, Carol Graham, Jim Lawrence, Mariner Manchester, Margaret Ross, Shirley Schimanski, Charlotte Sullivan, Jim Snook, and Barbara White. I am especially indebted to Stuart A. Hoffman of Star Publishing Co. for his support and guidance.

I have been aided in preparing this volume by my teaching activities, visits to schools nationwide, participation in national, regional, and state business and vocational conferences, and reviewing the suggestions of many people who have used our combined book. All have given me a unique opportunity to write BUSINESS MATH WITH ELECTRONIC ACCURACY. All corrections and suggestions are welcome and will be answered in writing.

Ron Merchant

# HOW TO USE THIS TEXT

This text is meant to help you develop two essential skills: (1) the ability to solve business problems involving mathematics and (2) the ability to use calculators efficiently. To accomplish its purpose, the book uses an integrated approach. It provides a thorough review of basic arithmetic; careful introduction to principles; pretests and branching instructions; guidelines for operating calculators; numerous problems to work; and self-tests to check performance.

Each chapter begins with a list of **instructional objectives** and a description of the content and its importance. Be sure to read these introductory materials — they let you know where you are going and why.

For each of the five sections in Chapters 1 and 2 that review arithmetic skills you will find a **pretest**. These pretests will tell you how much you already know of each subject and will guide you in designing your own individual program of review. Using small units of material and the discovery method of learning, your individualized program will introduce you to basic mathematical principles, definitions, and sample solutions, and provide problems that suit your particular needs.

Every section within a chapter contains a series of **sample problems** plus instructions for solving them. Follow the instructions carefully before attempting the unanswered problems. When you have worked the problems as directed and recorded your answers, compare them with the correct answers, which follow each set of problems. If any of your answers are incorrect, determine why before proceeding to the next section. This will give you greater confidence in your mathematical ability.

To maximize your learning efficiency follow these guidelines:

- Read the sections of this book *in sequence*, solve the problems *in sequence*, and record each answer in the space provided. Decide on a definite answer, otherwise your learning effectiveness will be greatly reduced.
- Finish all the problems in a section before checking your work against the answers provided; correct any errors. So you won't be tempted to peek, you may want to cover the correct answers with an index card or piece of scratch paper while you work the problems.
- Pay careful attention to the hints given in enclosed boxes throughout the text. These hints will help you work more efficiently and give you a better understanding of what you are doing.
- Don't try to go too fast, even when the material seems easy. Concentrate on getting the correct response the first time. Each correct answer reinforces your knowledge and helps you learn the material.
- Don't spend too much time on any one concept. If, after a few minutes, you have made no progress, look at the answer and use it to help solve the problem. If you don't understand why a given answer is correct, note the problem and ask someone. If you are in class, discuss the concept with the instructor. Working several additional sets of problems will sometimes make the answer obvious. In any event, be certain you understand each set before completing a chapter.

- Be sure to take the self-tests at the end of each major topic. They not only review the content of the chapter but are part of your learning package. If you have difficulty on a self-test, return to the appropriate place in your text or ask your instructor for assistance. Be sure you understand each self-test question before attempting any examination.

**Remember:** To solve problems in business you must be able to use numbers. As with learning to ski or play the piano, you will learn to solve numerical problems only through imitation and practice. There are no magic formulas. If you want to be a problem solver, you must solve problems.

## **GENERAL RULES FOR ROUNDING**

**Rounding:** If the portion to be dropped begins with 5 or more, add 1 to the last figure retained. If the portion to be dropped is less than 5, discard it.

**Intermediate calculations:** Don't round off too soon. Carry intermediate answers to at least one place more than is needed in the final answer.

**Recording final answers:** Round money answers to the nearest cent (\$.01). Round percentages to the nearest tenth (.1%). Round decimal answers to the nearest thousandth (.001).

A more complete discussion of rounding is given in Chapter One.

**HINT:** Refer back to "How to Use this Text" several times during your reading.



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# **FUNDAMENTAL OPERATIONS, NUMBERS, ADDITION, AND SUBTRACTION**

# Chapter 1

## FUNDAMENTAL OPERATIONS, NUMBERS, ADDITION, AND SUBTRACTION

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### Instructional Objectives

After completing this chapter you should be proficient with:

- Numbers
- Addition
- Subtraction

You also will be able to pass Self-Test I, a 10-minute timed test on addition, subtraction, and certain properties of numbers, *without* the aid of a calculator.

To pass these tests you must complete 30 problems correctly and the number correct must be at least 90 percent of the number of problems you attempt.

**HINT:** For best results, be certain you have read “How to Use this Text,” at the beginning of the book.



Calculators are widely used in business, and the ability to operate them efficiently is a necessity in many jobs and useful in many other jobs. While electronic calculators are easy to use and all have a standardized 10-key keyboard, few people utilize their full capabilities. This chapter will help you learn the fundamental operations of addition and subtraction. It will help you learn to utilize more fully the electronic calculator and apply it in the solution of business problems.

## NUMBERS

Electronic calculators use numbers, so it is essential that you understand certain fundamental concepts of our number system. Take the following pretest to help decide if you want to review these concepts.

**HINT:** If you do not understand several of the problems on a pretest, simply skip the pretest and work the section. If there are only one or two problems on the pretest you do not fully comprehend, you may want to look up those types of problems in the unit that follows. Almost every student will need to do the first unit on Numbers. Many students, however, will be ready to skip the units following Pretest II – Addition, Pretest III – Subtraction, Pretest IV – Multiplication, or Pretest V – Division.



## Pretest I - Numbers

Using the digits 0 through 9, write seven hundred thirty-two thousand and four hundred eleven thousandths. \_\_\_\_\_ (1)

Round the following numbers to the nearest tenth.

434.5498 \_\_\_\_\_ (2)    9 325.487 \_\_\_\_\_ (3)

How many significant digits do the following numbers have?

\$10 500 \_\_\_\_\_ (4)    \$17 000 \_\_\_\_\_ (5)    \$34.89 \_\_\_\_\_ (6)

Round the following numbers to the nearest thousand.

789 548 \_\_\_\_\_ (7)    584.058 \_\_\_\_\_ (8)    28.002 \_\_\_\_\_ (9)

Using words, write out the number 74.02. \_\_\_\_\_ (10)

*Answer:*

(1) 732 000.411; (2) 434.5; (3) 9 325.5; (4) 3; (5) 2; (6) 4; (7) 790 000; (8) 1 000; (9) 0

(10) Seventy-four and two hundredths

If you did not miss any problems, skip to PAGE 10, "General Rules for Rounding."

If you missed one or more problems or would like to review the number competencies listed below, continue with this section.

## Number Competencies

You need to understand certain fundamental concepts of our number system before you can use them to solve problems with business mathematics.

When you have completed this section on numbers you will be able to:

- Read numbers
- Write numbers
- Distinguish whole numbers from decimal numbers
- Round numbers
- Recognize significant digits

If you have not yet read "HOW TO USE THIS TEXT," read it now.

## OUR NUMBER SYSTEM

1. The number system we use today is called the **Hindu Arabic number system**. It is a decimal place system because it is based on 10 symbols or digits. A **digit** is a one-place number. The only digits or symbols our regular system uses are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. The number 23 contains \_\_\_\_\_ digits; they are \_\_\_\_\_ and \_\_\_\_\_.

*Answer:*

Two    2    3

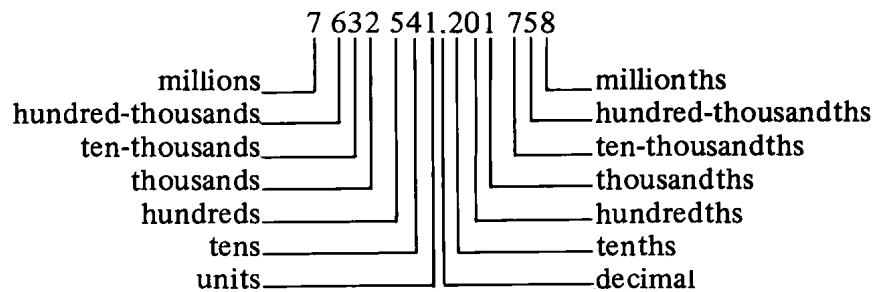
## PLACE VALUE

2. Digits obtain their value according to the **place** they hold. In the decimal system it takes ten in one place to equal 1 in the next higher place. It takes 10 ones to equal 10, \_\_\_\_\_ tens to equal 100, and \_\_\_\_\_ hundreds to equal 1 000.

*Answer:*

10      10

3. The following example shows the place name of each digit.



In the previous example there are 4 tens, \_\_\_\_\_ hundreds, and \_\_\_\_\_ thousands.

*Answer:*

5      2

4. The value of a digit increases/decreases ten times with each position it is moved to the left of the decimal and the value of a digit increases/decreases ten times with each position it is moved to the right of the decimal.

*Answer:*

*increases      decreases*

5. 732 means  $(2 \times 1) + (3 \times 10) + (7 \times 100)$ , or  $2 + 30 + 700$ .  
859 means  $(9 \times 1) + (5 \times \text{—}) + (8 \times \text{—})$ , or  $9 + 50 + 800$ .

*Answer:*

10      100

6. A **whole number** consists of one or more digits all to the left of the decimal point. A **decimal number** has one or more numbers to the right of a decimal point.

.31 is a \_\_\_\_\_ number, 64 is a \_\_\_\_\_ number.

*Answer:*

*decimal      whole*

7. A decimal number is less than/greater than a whole number.

*Answer:*

*less than*

8. When a decimal point separates a whole number and a decimal number, it is called a **mixed number**. 13.71 is a \_\_\_\_\_ number because it consists of a whole number (13) and a decimal number (.71).

*Answer:*  
*mixed*

## READING AND WRITING NUMBERS

9. Notice that in the number 4 123 478 123, spaces break up the number into groups of \_\_\_\_\_ digits. Each group of digits has a name: units, thousands, millions, or billions. Reading numbers is easy when you read each group of three as a three-place number followed by the name of that group. That is, each group of \_\_\_\_\_ is read separately and then the name of that group is \_\_\_\_\_.

*Answer:*  
*3 3 read or added*

10. When writing numbers in words be sure that composite numbers like 34 have a hyphen separating the digits: thirty-four.

The following numbers are written: 37 (thirty-seven); 52 \_\_\_\_\_  
29 \_\_\_\_\_.

*Answer:*  
*fifty-two; twenty-nine*

11. The number 3 451 002 is read: three million, four hundred fifty-one thousand, two. (Say “two,” not “two units.”) The number 4 850 000 is read: four \_\_\_\_\_, eight hundred fifty \_\_\_\_\_. Since there are no units, there is nothing to read for them.

*Answer:*  
*million thousand*

12. How would you write in words 6 452 338? \_\_\_\_\_  
\_\_\_\_\_

*Answer:*  
*Six million, four hundred fifty-two thousand, three hundred thirty-eight*

13. Never say “and” when reading whole numbers. Use the word “and” to indicate the decimal point when reading \_\_\_\_\_ numbers. For example: read 2.7 as “two and seven tenths.” Read 31.045 as “thirty-one and forty-five thousandths.” Read 6 025.002138 as “six thousand, twenty-five and two thousand, one hundred thirty-eight millionths.”

*Answer:*  
*mixed*