

Business Math FOR **DUMMIES®**

by Mary Jane Sterling



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About the Author

Mary Jane Sterling is the author of four other *For Dummies* titles: *Algebra For Dummies*, *Algebra II For Dummies*, *Trigonometry For Dummies*, and *Math Word Problems For Dummies*. She has honed her math-explaining skills during her years of teaching mathematics at all levels: junior high school, high school, and college. She has been teaching at Bradley University, in Peoria, Illinois, for almost 30 of those years.

When not teaching or writing, Mary Jane keeps busy by working with her Kiwanis Club, advising Bradley University's Circle K Club, and working with members of the Heart of Illinois Aktion Club (for adults with disabilities). All the volunteer projects taken on for these clubs help keep her busy and involved in the community.

Dedication

I dedicate this book to my two business math inspirations. First, to my son, Jon, who came up with the idea of writing a book for business professionals who needed a refresher — specifically for his real estate workforce. And second, to my husband, Ted, who is the financial guru of the family and has had years of experience in the business and financial arena.

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Introduction

Business and mathematics — they just seem to go together. Of course, I could make a case for *any* topic to successfully mesh with math. Then again, I'm a bit prejudiced. But you have to agree that you can't do much in the home or in the business or real estate worlds without a good, solid mathematical background.

I became interested in writing *Business Math For Dummies* because of Jon, one of my children. He works with real estate agents and managers, and over time he heard a recurring complaint: This or that agent hadn't done math in a long time and couldn't remember how to do the proper computations. Sure, computers and calculators do the actual arithmetic, but you have to know what to enter into the computer or calculator. Finding the area of a circular garden isn't terribly difficult if you know how to use the formula for the area of a circle, but it can be tricky if you haven't used that formula in a long time.

For instance, you may not remember what *pi* is (and I don't mean the apple or cherry variety). And who would have thought that you'd ever need to solve a proportion after you grew up and got a job? The math in the business world isn't difficult, but it does take a refresher or a bit of relearning. And here you find it — all in one spot.

In this book, you find tons of mathematical explanations coupled with some sample business or financial problems. I show you the steps used in the math and explain how the answers help you complete a transaction or continue on with a project.

About This Book

In your business, you probably have all sorts of specialized procedures and formulas. And you're probably pretty good at what's particular to your situation. So what you find in this book is all the background info for more specialized material. I show you how to do financial computations that use simple formulas along with other more-involved formulas. You'll find geometric structures and patterns and uses of fractions, decimals, and percents.

Having said all that, I doubt you want to read this book from cover to cover. After all, no snooze alarm is loud enough to rouse you if you attempt a front-to-back read. But if you love math that much, please feel free to make this a pleasure read. However, most folks simply will go to those topics that interest or concern them.

This modularity is what's so great about this book. You can jump backward or forward to your heart's delight. In fact, I refer to earlier material in later chapters (if I think it would help explain the topic at hand), and I titillate you early on with promises of exciting applications further on as you read. In other words, you'll find the organization to be such that you can quickly turn to the pages you need as you need them.

Please use this book as a reference or a study guide. You don't want to memorize the formulas and procedures shown here. If you did, your head would surely burst.

Conventions Used in This Book

This book is designed to be user friendly. I'm guessing that you're too busy to have to hunt up a dictionary if a word isn't familiar or to poke around for a formula (and how to use it) if you need to determine an item's markup or a loan's payment amount.

So as you read this book, you'll see important terms highlighted with *italics*, and I always include a definition with these terms. **Boldfaced** text highlights keywords of bulleted lists and the actions you must take in numbered steps. Also, when a process requires a formula, I state the formula and identify all the letters and symbols.

What You're Not to Read

Occasionally in this book you'll see some material accompanied by a Technical Stuff icon. And you'll come across some sidebars, which are those gray-shaded boxes with interesting but nonessential information. You'll find these items when I just couldn't help myself — I had to tell you about some mathematical property, geometric eccentricity, or financial feature because I found it to be so fascinating. Do you need the information in order to understand the process? No. Will it enlighten you and make your world a better place? Well, of course. You can take them or leave them; pass them by today and come back to them in the future — or not.

Foolish Assumptions

I find that separating my foolish assumptions from my realistic assumptions is really difficult. After all, what you may consider to be foolish, I may consider to be realistic (and vice versa). But let me tell you what I think, and you can do the sorting.

I'm assuming that you have access to at least a simple scientific calculator. You really can't do some of the problems involving powers, radicals, and huge numbers without the help of a calculating device. So, you're really handy with an abacus? All the more power to you — but I think you still want to invest in a calculator. Similarly, computers and spreadsheet software programs aren't a necessity, but I assume that you can use a computer, even if you don't have your own. After all, today's financial world is handled pretty much using spreadsheets with formulas embedded into them.

Most of the math in this book is arithmetic, but you also find some basic algebra. Here's the deal: You don't need to solve tricky quadratic equations or problems involving calculus, but I do assume that you understand how to solve an equation such as $1,000 = 3x - 8$ (by finding the value of x). Don't panic! I show you how to do these problems, but I assume that you've at least seen the algebraic process before and just need a reason to use it.

How This Book Is Organized

Mathematics and business just seem to go together naturally, but I do try to organize the different topics and techniques in this book, and I give you some practical perspective of how they relate. Even when I start with the mathematics in the beginning, you see how those basic math operations and techniques relate to business topics; otherwise you wouldn't be inspired to continue reading the material! In all the chapters, I reference other topics that are closely related to what you're reading to save you time in your quest for the information you need.

Part I: Reviewing Basic Math for Business and Real Estate Transactions

The basic math of business is really the basic math of life. So, the chapters in this part take you through the fundamentals of dealing with fractions, decimals, percents, and proportions. You see how the different forms that a percent can take are used to do computations necessary to be successful in business. A little algebra is even thrown in to make the topics interesting. Algebra is a rather cryptic language, but a simple translation is all you need to make your way.

Part II: Taking Intriguing Math to Work

Formulas make the world go ‘round — literally. But the formulas in this section mainly deal with money and financial situations, measurements, and statistics. In this part, you see how to use formulas in spreadsheets, and you find your way around statistical information.

Part III: Discovering the Math of Finance and Investments

The chapters in this part are, well, *interesting*. In other words, simple interest and compound interest are used to a large extent in this part. You use formulas involving interest to determine how much an investment grows over time. And you use interest to determine the extra expense involved when borrowing money over different periods of time. Plus, no discussion of finance would be complete without talking about stocks and bonds. You find the ins and outs of their mathematics in this part. And, as promised, you find information on promissory notes as an option for borrowing.

Part IV: Putting Math to Use in Banking and Payroll

Bank accounts are places to accumulate money and grow interest. You also use them to make payments to suppliers or employees. In the chapters in this part, you see variations on budgets and payroll management. Insurance and valuation of assets both play a big part in the overall financial picture of a business, which is why I include them in the general picture of managing the income and outgo involved in running a business successfully.

Part V: Successfully Handling the Math Used in the World of Goods and Services

Whether you’re on the buying end or the selling end of a business, you need to understand that discounts, markups, overhead, and depreciation all play a part in your business’s profits, revenue, and costs. So in this part, I show you the mathematics involved and give you some examples. And because managing inventory is critical to the health of a company and its revenue figures, I explain methods for turnover and valuation.

Part VI: Surviving the Math for Business Facilities and Operations

When purchasing property, you need accurate measurements, a fair assessment of the value, and a reasonable mortgage payment. Also, you need to secure a profitable rental amount if you're leasing the property to others. You find the math necessary for all the aspects of measuring, borrowing money for, purchasing, and renting property in this part's chapters.

Part VII: The Part of Tens

A *For Dummies* book isn't complete without the Part of Tens. In this part, I include two top ten lists that give you quick, fun, and relevant information. For instance, I provide ten tips for managing leases and rental property, as well as a list of the ten main things to look for when reading a financial form.

Icons Used in This Book

In the margins of this book, you see little pictures, which are called icons. These icons highlight specific types of information. They aren't meant to distract you. No, instead they're meant to attract your attention to items that warrant notice. Here are the icons I include and what they mean:



This icon calls your attention to situations and examples where the business math that's discussed is used in a sample situation.



This icon flags important information that you should keep in mind as you read or solve a problem. I often use this icon to highlight a rule or formula that you use in the current discussion. These rules or formulas are necessary for the mathematical computation and are applicable to other problems related to the topic.



When you see this icon, you'll know that you're coming upon a helpful or time-saving tip.



You'll find this icon attached to interesting but nonessential information. The information next to this icon is loosely related to the discussion at hand but isn't necessary to your understanding of the topic.



This icon points out a particularly sticky problem or common misunderstanding. I use this icon sparingly so that, when you do see it, you know I'm serious about the information.

Where to Go from Here

The range of topics in business mathematics (and therefore in this book) is pretty broad. However, because of the large scope of material shown here, you'll be able to find what you need in one place or another. If you need some help with the basics, feel free to start with the first part. Then jump to the chapters that relate to your specific business situation. You just need to pick and choose what you need from the different parts of this book (and then use them or abuse them to your heart's content).

As you're reading through the book, remember that if you come across a particular mathematical process that you can't quite remember, you can be sure I refer you to the chapter that covers the process or something very much like it. You can then apply the concepts or processes to your particular situation. Feel free to use this book as a reference more than a guide. It's here to clear up the puzzling points and get you set in the right direction.

Part I

Reviewing Basic Math for Business and Real Estate Transactions

The 5th Wave

By Rich Tennant



"David's using algebra to calculate the tip.
Barbara— would you mind being a fractional
exponent?"

In this part . . .

The mathematics of fractions, decimals, and percents is fully dissected and then put back together in these chapters. Why? Well, the world of business is tied to these topics. So, in this part, you investigate percent increases and percent decreases, and you see how the math goes right along with fractions and proportions. You also discover how to create new ways of using percents and proportions that you haven't even considered.

Chapter 1

Starting from the Beginning

In This Chapter

- ▶ Aligning fractions, decimals, and percents to their place in business
- ▶ Understanding how formulas can help you solve business math problems
- ▶ Using exponents in everything financial
- ▶ Dealing with the math for inventory, overhead, and depreciation
- ▶ Picturing business scenarios using tables, charts, and graphs

Business mathematics involves a lot of arithmetic, some algebra, a touch of geometry, and dubs and dabs of other mathematical topics. But the major portion of mathematics that's found in business is arithmetic.

Getting you off to a good start is the goal of this chapter. You may be looking for answers to some deep, dark mathematical secrets; this chapter helps you light the way toward realizing that the basic math involved in business was never meant to be kept a secret. You may not see the relevance in some mathematical processes. But this chapter makes the necessity for mathematics abundantly clear.

On the other hand, you may have a firm grasp on the business math basics; you're looking for more — for some explanations as to *why*, not just *how*. So, in this chapter, I show you many of these *whys*, and I direct you to even more complex mathematics when the occasion allows.



Most of the math in business isn't compartmentalized into one section or another. Fractions and decimals are found in all applications. Proportions and percents are rampant. And measurements are necessary for many different business processes. In other words, the math of business involves computations shared by all the different aspects. The main trick to doing the math is to know when to apply what. Use the material in this book to help yourself become comfortable with when to use what and how to use it successfully.

Fracturing the Myths about Fractions, Decimals, and Percents

It could be that adding fractions is something that you do every day; in that case, fractions are fresh in your mind, and you find them easy to deal with. On the other hand, you may not have found a common denominator in years (and hope never to have to again). You also may have made it a point not to deal with decimals. But fractions and decimals can't be ignored; they need to be embraced — or, at least, tolerated.

It's an undeniable fact that fractions, decimals, and percents form the basis of much of the math in business. Before you run away, screaming and sobbing, let me tell you that in this book, I ease you into some of the less popular mathematical subjects when they arise. I show you the way to deal with the math in the most quick and efficient way possible.

In Part II of this book, you find fractions cropping up in formulas and with various measurement situations. You probably never complained much when told that you had to take half of an amount to complete a computation. After all, a half is the simplest fraction. But, if you can manage one fraction, you can manage them all. In Chapter 2, I go over some of the operations needed with fractions, and I show you how to change them to percents and back again.



Decimals are the middle ground between fractions and percents. You really can't get around them — nor do you really want to avoid them. When figuring percent increases or decreases in Chapter 3, you see how the change from percents to decimals is necessary. Discounts and markups are often confusing to understand and compute, but Chapter 17 shows you how to handle the ups and downs correctly using our good friends, the percent and decimal.

And how in the world can you deal with the interest earned on your account unless you haul out those delightful decimals? When you compute simple interest, you use the formula $I = Prt$. Nestled between the money amount (P stands for principal) and the number of years involved (t stands for time) is the rate of interest, r , which is given as a percent and changed to a decimal in order to do the computation.



You find percents and decimals cropping up throughout this book. If you come across a conundrum (okay, even just a little challenge), you can always refer to the chapters in Part I, which deal with fractions, decimals, percents, and their basic applications and computations.

Capitalizing on Patterns in Formulas

A *formula* is nothing more than a relationship between values that always works and is always true. Wouldn't it be nice if formulas worked for people, too? But that's the big difference between people and numbers. Numbers are known to behave much better and more predictably than people, which is why you can embrace formulas with such confidence.

Formulas have been around since the beginning of recorded history, but in the Middle Ages, formulas weren't in their current neat-and-compact forms. It was only a couple hundred years ago that algebraic notation became popular and formulas such as $P = 2(l + w)$ and $a^2 + b^2 = c^2$ became a part of mathematical history.



The trick to working with any formula is knowing what the different variables stand for and how to perform the mathematical operations involved. For example, you should know that $A = \frac{1}{2}bh$ gives you the area of a triangle. You simply multiply one side of the triangle (the base, b) by the height of the triangle (h , which is measured from the base) and then find $\frac{1}{2}$ of the product. (Check out Chapter 21 for more on the area formulas.)

In Chapter 5, I go over the different rules for performing more than one operation in an expression. In all of Part II, you see how to use formulas in different settings. It's a splendid situation when you can put a formula into a computer spreadsheet and let the technology do repeated computations for you. So in Chapter 5, I give you some spreadsheet guidance.

Get ready, because you can find some pretty impressive formulas in Parts III and VI, where loans, mortgages, and other financial manipulations play a big part in the discussion. You don't want to memorize the formulas for annuities and sinking funds, however. You just need to become comfortable using the formulas and have confidence in your answers. You can always flip to the actual formula when it comes time to use it.

You probably remember how to do a *mean average*, but do you know whether the *median* or *mode* would be a better measure of the middle in your particular situation? Just use the formulas or rules in this book to find out. For instance, when you're managing rental properties or another business, you need to do some comparisons from month to month and year to year. Your statistics skills, which you can gain in Chapter 8, will put you in good stead for the computations needed. You don't find any heavy-duty statistics or statistical formulas in this book. For further investigations, check out *Statistics For Dummies* (Wiley).

Finding the Power in Exponents

An *exponent* is a power. In other words, it's shorthand algebra that tells you to multiply something by itself over and over again. Exponents are fundamental in compound interest formulas and amortized loan formulas. In fact, they're great for everything financial.

For example, do you want to know what an investment of \$10,000 will be worth in 5 years? Part III presents lots of options for dealing with your money and for doing the computations necessary. Mortgage rates change constantly, and so you often need to make decisions on your mortgages and loans. Those decisions rely heavily on computations using exponents. You find the low-down in Part III and, again, in Part VI.

Are you a little shaky on the use of exponents? Check out Table 1-1, which gives you a quick reminder.

Table 1-1 The Rules for Operations Involving Exponents		
Operation	How to Handle	Example
Multiplying the same bases	Add the exponents.	$a^x \cdot a^y = a^{x+y}$
Dividing the same bases	Subtract the exponents.	$\frac{a^x}{a^y} = a^{x-y}$
Raising a power to a power	Multiply the exponents.	$(a^x)^y = a^{xy}$
Handling negative exponents	Move the power to the denominator (the bottom part of the fraction) and change the sign.	$a^{-x} = \frac{1}{a^x}$
Dealing with roots	Roots change to fractional exponents.	$\sqrt[x]{a} = a^{1/x}$



Use the rules involving multiplication and roots to simplify $9^{3/2} \sqrt{9}$.

First off, change the radical to a fractional exponent. Then multiply the two numbers together by adding the exponents like this:

$$9^{3/2} \cdot 9^{1/2} = 9^{3/2 + 1/2} = 9^2 = 81$$

Okay, that was fun. But you may not be convinced that exponents are all that important. What if I asked you to do a quick comparison of how much more money you accumulate if you invest a certain lump sum for 10 years instead of just 5 years? I show you how the exponents work in the following example. (You can go to Chapter 9 to get more of the details.)