Essential Math for Accounting: Part I

A Review of Basic Math Essential for Accounting and Business

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Worthy and James Publishing
www.worthyjames.com

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Essential Math for Accounting: Part I

BRIEF OVERVIEW

Introduction

This review is designed to give you a review of all the math you will need for this book and for beginning your work in any introductory accounting text. Combined with the math review in the next special report of this series, you will have a review of all the math you will need for your entire first year of accounting study … and more.

How to use this section

This material begins at the most basic level—arithmetic operations. You do not need to read the entire math review. Simply study those topics that you feel you need to practice.

- Read the topic that you feel you need to practice.
- When you finish reading, work the "Practice" problems for that topic.
- Review the solutions and highlight the problems you missed, so you can try them again or ask your instructor or classmates for more help.

Math review in the next volume …

This special report is the first in a series of two. The second special report in this series continues the math review, which includes:

- explanation and use of fractions
- continuation of basic algebra topics

In this section, you will find:

Percent

Positive and Negative Numbers

Introduction to Algebra and Equations

▼ *General Introduction: Numerals are Symbols for Amounts*

NUMERALS

Importance of numerals

We all see and use numerals every day, usually without giving them much thought. However, the individual numerals are really a foundation of all of our mathematics! Let's take a moment to be sure that we are comfortable about what numerals really mean and how they function.

Numerals are symbols

A numeral is a symbol for an amount of something. In the number system with which most of us are familiar, there are ten symbols. For example, suppose that some of us are hungry. I suggest that we order pizza. How many pizzas? We can use symbols to express the number of pizzas we want:

Numeral Symbol	Written as …	Number of Pizzas
0	"zero"	
1	"one"	
2	"two"	
3	"three"	
4	"four"	
5	"five"	
6	"six"	
7	"seven"	
8	"eight"	
9	"nine"	

You can see that there is a numeral symbol for each individual amount from zero units to nine units or, in this case, pizzas.

NUMERALS (continued)

Only ten symbols are used

Suppose that we wanted to order ten pizzas, or eleven, or twelve … or twenty. Could we invent more symbols for more units? Yes, that would be possible. For example, we could create a symbol like "*" for the number ten, or perhaps the symbol "Y" for the number eleven, and so on; however, this is not practical. We would need an unimaginably large number of symbols for all the possible numbers, and we could never remember them! For this reason, our number system uses only ten symbols, but in a very clever way.

▼ *The Place-Value Numeral System*

WHAT THE SYSTEM IS

Introduction

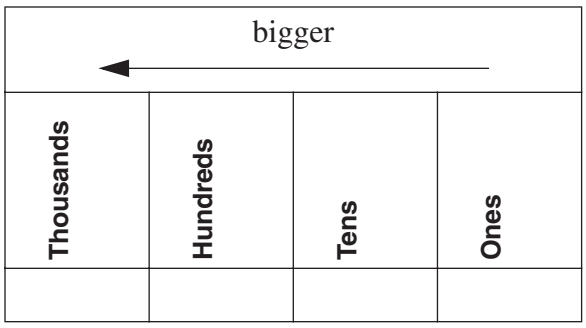
So far, we have only been able to express amounts up to nine units of something. Clearly, this is not enough. But if we are limited to only ten symbols, what can we do? A long, long time ago, the clever people who invented our number system gave this problem a great deal of thought. Their solution was something called the "place-value" numeral system.

Definition: the place-value numeral system

The place-value numeral system is a method that determines the value of a numeral by how it is positioned relative to other numerals.

Numeral groups

In the place-value numeral system, the basic ten symbols are placed into groups. The position—or place—of each group determines the size of the numerals within the group. Below is a chart of some number groups as they are positioned in a place-value system.

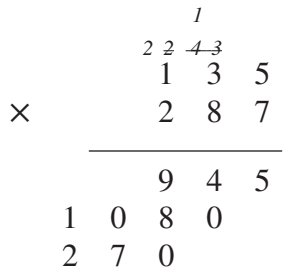
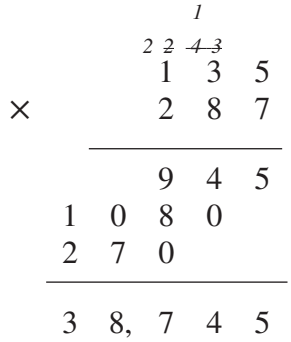


HOW TO MULTIPLY NUMBERS (continued)

<table>
<tr><th>Step</th><th colspan="2">Action</th><th>Example</th></tr>
<tr><td rowspan="4">3</td><td colspan="2">Move left to the next digit in the multiplier (8). Multiply this by the right digit in the top factor (5) (5 times 8 is 40).</td><td rowspan="2">2 4 3
1 3 5
× 2 8 7
9 4 5
0
Notice the alignment</td></tr>
<tr><td>If …</td><td>Then, under the line …</td></tr>
<tr><td>the product is 9 or less,</td><td>write the product in the same place-value column as the digit you are using in the multiplier.</td></tr>
<tr><td>the product is greater than 9,</td><td>• write the right digit (0) of the product (40) in the same place-value alignment as the digit you are using in the multiplier.
• write the left digit (4) of the product above the next number in the top factor. (Cross out any other number previously written here.)</td></tr>
<tr><td rowspan="4">4</td><td colspan="2">Using the same multiplier, multiply the next digit to the left in top factor (3 times 8 is 24). Then add the new number written above the top digit from the previous calculation (24 plus 4 is 28).</td><td rowspan="2">2 2 4 3
1 3 5
× 2 8 7
9 4 5
8 0</td></tr>
<tr><td>If …</td><td>Then, under the line …</td></tr>
<tr><td>the product is 9 or less,</td><td>write the product in the next available place-value column to the left of the previous number.</td></tr>
<tr><td>the product is greater than 9,</td><td>• write the right digit (8) of the product (28) in the next available place-value column to the left of the previous number.
• write the left digit (2) of the product above the next number in the top factor.</td></tr>
<tr><td colspan="2">Using the rules, finish multiplying all the digits in the top factor by the same digit (8) in the multiplier.</td><td>2 2 4 3
1 3 5
× 2 8 7
9 4 5
1 0 8 0</td></tr>
</table>

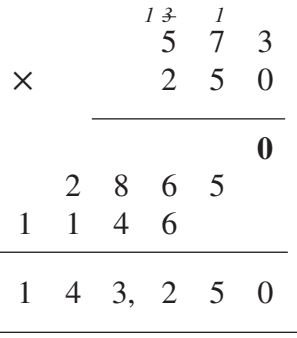
(table continued on next page)

HOW TO MULTIPLY NUMBERS (continued)

Step	Action	Example
5	Return to Steps 3 and 4 until all the digits in the top factor have been multiplied by all the digits in the multiplier.	
6	Add the place-value columns under the line to obtain the answer (in this example: 38,745). *Note:* The answer is called the **product**.	

When the multiplier has zeroes

If the multiplier is a number that contains one or more zeroes, do not multiply by a zero. Instead, put a zero under the line in the same place-value column as the zero in the multiplier. Then move left in the multiplier to the next number that is not a zero, and follow normal procedures.

Example 1: Multiply 573 by 250. The product is: 143,250.	

HOW TO MULTIPLY NUMBERS (continued)

Example 2: Multiply 573 by 205.

The product is: 117,465.

$$
\begin{array}{rrrrrr}
 & & & {}^{1\,\not{3}}5 & {}^{1}7 & 3 \\
\times & & & 2 & 0 & 5 \\
\hline
 & & 2 & 8 & 6 & 5 \\
 & & & & \mathbf{0} & \\
1 & 1 & 4 & 6 & & \\
\hline
1 & 1 & 7, & 4 & 6 & 5
\end{array}
$$

Shortcut: when there are zeroes at the end of factors

Whenever a factor ends in zero, you can drop the zero before you multiply, then do the multiplication with the remaining digits. Attach the same number of zeroes to your answer as the number of zeroes you dropped. This saves time and reduces error.

Example: Multiply 4,500 and 320.

You can drop a total of three zeroes before you multiply. You will then attach three zeroes back to the product.

Answer: 1,440,000.

$$
\begin{array}{rrrrrrr}
 & & 4 & 5 & & & \\
\times & & 3 & 2 & & & \\
\hline
 & & 9 & 0 & & & \\
1 & 3 & 5 & & & & \\
\hline
1, & 4 & 4 & 0, & \mathbf{0} & \mathbf{0} & \mathbf{0}
\end{array}
$$

Attach zeroes ↑

HOW TO MULTIPLY NUMBERS (continued)

Characteristics of multiplication

Numbers can be multiplied in any order and the answer is the same:
- Multiplying $7 \times 25 = 175$
- Multiplying $25 \times 7 = 175$

Numbers can be multiplied in any groups and the answer is the same:
- Multiplying $(9 \times 48) \times 22$ is $432 \times 22 = 9{,}504$
- Multiplying $9 \times (48 \times 22)$ is $9 \times 1{,}056 = 9{,}504$

The product of any number and zero is always zero:
- Multiplying $245 \times 0 = 0$

The product of any number and 1 is always the number itself:
- Multiplying $245 \times 1 = 245$

Multiplying a sequence of numbers

The multiplication procedure is the same. Simply multiply the next number times the previous result, until there are no more numbers to multiply.

Example: Multiply the following numbers: $27 \times 50 \times 219$

- First, multiply 27 times 50: $27 \times 50 = 1{,}350$
- Then multiply by the next number: $1{,}350 \times 219 = 295{,}650$

PRACTICE

SOLUTIONS FOR MULTIPLICATION BEGIN ON PAGE 30.

REINFORCEMENT PROBLEMS: MULTIPLICATION

1. In the table below, complete each indicated operation and write your answer in the "Answer" column next to the operation.

Multiply the following numbers …	Answer
a. 255×8	
b. 255×38	
c. 255×938	
d. $255 \times 2{,}938$	
e. 207×412	
f. $2{,}400 \times 3{,}500$	
g. 909×303	
h. 684×729	
i. 250×190	
j. $1{,}877 \times 300$	
k. 72×211	
l. 952×743	
m. $822 \times 3{,}005$	
n. 215×49	

2. a. If professor Gillis grades 4 tests per hour, how many tests can he grade in 8 hours?

   b. A business collects $1 of sales tax for every $15 of sales. If the sales tax collection was $9,000, what was the total amount of sales?

   c. The labor cost for manufacturing a computer is $52 per computer. What is the total labor manufacturing cost if 850 computers are manufactured this week?

PRACTICE · PRACTICE · PRACTICE · PRACTICE · PRACTICE

WHICH OPERATION DO I USE? (continued)

Division

The following table shows you how to identify situations that require division. In all cases, the underlying idea is that division finds a multiple that one number (the dividend) is of another number (the divisor).

Divide to …	Examples
a. Find the number for which some amount is a multiple (a "number of times") that number. *Note:* This is opposite of item "C" in multiplication (see page 49).	• Two aircraft are flying away from Dallas. The first aircraft is 1,200 miles away and this is 4 times as far away from Dallas as the second aircraft. How far away from Dallas is the second aircraft? (You want to find the number for which the first aircraft's distance of 1,200 miles is 4 times that number. 1,200 miles / 4 = 300 miles) • Dave earns $1,725 per week. If Dave earns 3 times as much as John, how much does John earn? (You want to find the number for which Dave's $1,725 is 3 times that number. $1,725 / 3 = $575)
b. Calculate a rate to compare an amount of something to a single unit of something else. *Note:* Rate is frequently described by using the word "per."	• Castlewood Company used up $185,000 over a period of 20 days. What was its rate of loss of cash per day? (You are comparing dollars to days. $185,000 / 20 **days** = 9,250 **dollars** per **day**) • D'Agostine's Catering Company used 105 pizzas to serve 420 people. What is the rate of people per pizza? (You are comparing people to pizzas. The rate per unit is 420 **people** / 105 **pizzas** = 4 **people** per **pizza**)
c. Find the size of equal parts when you know the total and the number of parts. *Note:* The answer can also be interpreted as a rate.	• If a rope is 24 feet long and divided into 8 pieces, how long is each piece? (24 **feet** / 8 **pieces** = 3 **feet** for each **piece**) • Denise used 35 gallons of lemonade to pour into 10 equal containers. How many gallons of lemonade does each container hold? (35 **gallons** / 10 **containers** = approximately 3.5 **gallons** in a **container**)
d. Find a number of units, when you know the total units and the rate per unit. *Note:* Because you are dividing by similar kinds of units, the answer is never a rate.	• Roswell Company manufactured and shipped boxes containing 12,000 pens. If each box contains 8 pens, how many boxes were shipped? (The rate per unit is 8 pens per box. 12,000 **pens** / 8 **pens** per box = 1,500 boxes) • Clovis Corporation budgeted a total of $300,000 to purchase new computers. If each computer costs $2,000, how many new computers can be purchased? (The rate per unit is $2,000 per computer. **$**300,000 / **$**2,000 per computer = 150 computers) • D'Agostine's Catering Company is expecting 420 people for a party. The company is providing pizza for the guests. If one pizza serves 4 people, how many pizzas will be needed? (The rate per unit is 4 people per pizza. 420 **people** / 4 **people** per pizza = 105 pizzas)

PRACTICE

SOLUTIONS FOR CHOOSING THE CORRECT OPERATION BEGIN ON PAGE 55.

REINFORCEMENT PROBLEM: CHOOSING THE CORRECT OPERATION

1. a. For each of the separate situations in the table, place an "✘" in the correct box to indicate which type of calculation is required. (For some items, more than one calculation is needed.)

   b. Calculate the answer to each item after you complete part "a."

Item	Add.	Sub.	Mult.	Div.	Answer
1. Texarkana Company began the week with $15,404 in its checking account. There is $3,400 in the account at the end of the week. By how much did the account change?					
2. McLennan Business Supplies sold 125 computers, 1,127 notebooks, 16 printers, 5 fax machines, 10 modems, and 422 pens. How many items did the company sell?					
3. K.C.'s barbecue restaurant cooked 350 meals and used up 25 gallons of barbecue sauce. How many meals per gallon did the company cook?					
4. Austin Company is creating a computer software product that it wants to finish in one year. The company has estimated that approximately 34,000 labor hours will be required to complete the project. If one employee works an average of 2,000 hours per year, how many employees will be required for the project?					
5. Cisco Partnership has 12 employees that earn $23.00 per hour. If each employee works 8 hours per day, what is the daily total pay for all employees? What is the weekly pay for a 5-day week?					
6. Cerritos Enterprises made sales to customers totaling $478,300. If total expenses were $312,500, what was the profit?					
7. Fullerton Company had advertising expense of $147,000 and Merced Company had advertising expense of $12,250. The expense for Fullerton was how many times that of Merced?					
8. The net income of Savannah Company was 4 times the net income of Barnesville Company. If Savannah Company earned $81,000, how much did Barnesville earn?					
9. Martinez Enterprises produces 3 times as many items as Cerritos Enterprises. If Cerritos produced 4,200 units last year, how many did Martinez produce?					

OVERVIEW OF PERCENT (continued)

Examples

- To express the idea that 7 out of every 100 units are unsatisfactory, we would say, "We have a rejection rate of 7 percent." (We could also have said "seven hundredths.")
- To say that $28 out of every $100 of income is paid as taxes, we would say that the "tax rate is 28%." (We could also have said "twenty-eight hundredths.")
- To say that Jones Company has $125 of sales for every $100 of sales of Smith Company, we would say, "Jones Company sales are 125% of Smith Company sales." (We could also have said "one hundred twenty-five hundredths.")

CONVERTING NUMBERS TO AND FROM PERCENT

Any number can be 100%

It is not necessary to compare a number to exactly 100 in order to use percent. Any number can be expressed as a percent of any other number which represents a whole amount. Use the procedure below.

Procedure: convert a number into a percent

Imagine that we own a store that sells computer equipment. Suppose that we have 53 computers in our store, which are part of a total of 212 different items for sale in the store. The following table shows how to express 53 as a percent of 212.

Step	Action	Example
1	Identify a **base amount**. The base amount is the entire or whole amount of something, or a reference amount. It represents 100%. *Note:* The base amount often follows the word "of."	The base amount is 212 (units of merchandise).
2	Identify the **portion**. The portion is the number that you are comparing to the base amount.	The portion is 53 (units of merchandise).

(table continued on next page)

CONVERTING NUMBERS TO AND FROM PERCENT (continued)

Step	Action	Example
3	Convert the portion to a decimal number by dividing the base amount into the portion.	53 / 212 = .25 (portion now in hundredths)
4	Convert the decimal to a percentage. Move the decimal point two places to the right by multiplying the decimal by 100.	.25 becomes 25
5	Add a percent symbol after the number.	25% (hundredths now expressed as percent)

Converting a percent to a decimal

If there is a number that is expressed as a percentage which you wish to convert to decimal, reverse the steps:

Step	Action	Examples	
1	Remove the percent symbol.	25% becomes 25	125% becomes 125
2	Move the decimal point two places to the left by dividing the number by 100.	25 / 100 = .25	125 / 100 = 1.25

Caution!

Numbers less than 1% are easy to misread!

When a number is less than 1%—that is, less than one part in a hundred—a decimal point is placed in front of the left digit of the percent. Be careful when reading these numbers. Examples:

	These …	both mean …	and NOT this …
Written as %	.8%	eight tenths of one percent	8% (eight percent)
Written as decimal	.008		

	These …	both mean …	and NOT this …
Written as %	.25%	twenty-five hundredths of one percent	25% (twenty-five percent)
Written as decimal	.0025		