BASIC BUSINESS MATHEMATICS

Third Edition

GERALD PINTEL/JAY DIAMOND

Third Edition

BASIC BUSINESS MATHEMATICS

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BASIC BUSINESS MATHEMATICS

Preface

The third edition of *Basic Business Mathematics* represents a major revision of the two earlier editions. Although it retains many of those elements in the original deemed significant for the better understanding of business mathematical computations, it offers new features which provide for better student comprehension.

The approach to the text is still arithmetic in nature rather than algebraic since this method is generally more relevant to usage during employment.

There are a number of important changes and additions to this third edition of *Basic Business Mathematics:*

1. The book is divided into two sections. The first deals exclusively with the basic mathematical computations of whole numbers, fractions, decimals, metrics, percentages, and interest. The second challenges the student to apply the computational skills derived from the first section in the solving of consumer- and business-oriented mathematical problems.
2. Each of the eleven chapters is subdivided into smaller specific units. Each unit features textual material, illustrative problems and solutions, and a series of practice problems for student use. At the end of each unit there are instructions for additional assignments. In situations where the units feature more than one concept, the unit is further subdivided and additional practice problems are offered to the student. This arrangement permits the individual to master the material before moving to the next concept.
3. All illustrative problems and their solutions have been highlighted to make their immediate detection simpler.
4. Additional summary problems have been added at the conclusion of each chapter. These problems offer a variety of types so that the students can learn to recognize which formula or concept should be applied for proper solving.
5. To better serve the needs of the metric user, the unit on the metric system has been expanded to include new materials.
6. All of the material dealing with interest rates, payroll deductions, and so forth have been updated.
7. The sections on whole numbers and decimals have been separated into distinct chapters. This permits mastery of whole numbers before the student is required to work with decimals.
8. A unit on checking accounts has been incorporated into the text to familiarize the individual with the understanding and arithmetic required of such an operation.
9. Complete new units on the investment of stocks and bonds are in the text so that students may understand the financial world as well as learn about the mathematics used in their transactions.
10. A discussion of sales tax including the use of charts and the necessary computations has been included.
11. The conversion of markup on cost to markup on selling and the reverse have been explained and demonstrated.
12. A unit on cumulative markup including computation and problems is in the text.
13. A comparison of discount vs. borrowing has been added.
14. The section on individual federal income taxes has been greatly expanded.
15. Included in the section on accounting is a discussion of the distribution of expenses and bad debts.

This revision features an instructor's edition complete with solutions to practice, unit, and chapter review problems. A prognostic test, as well as unit exams are also provided.

In addition there is an appendix in which the use of electronic portable calculators is explained and illustrated.

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I

BASIC MATHEMATICAL COMPUTATION

Essentially, the solving of any business- or consumer-oriented mathematical problem requires a strong background in arithmetic. Without a keen understanding of the fundamental operations including the handling of whole numbers, decimals, and fractions, it is virtually impossible to solve problems. Whether it is to master these basic arithmetic operations for the first time, or it is to serve as a review for those who might need refinement in this area, this section provides the necessary groundwork for success in business mathematics.

In these first five chapters, various units have been developed which deal with addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals, as well as percentages and interest. A unit on metric measurement is also included to give insight and comprehension of the system that is used in most of the countries of the world.

Once the material in this section has been mastered through the solving of practice problems, unit problems, and chapter review questions, the student will be able to apply what has been learned to the consumer and business applications in Section II.

Chapter 1

Fundamental Operations

UNIT 1. ADDITION

Addition is the most common of the fundamental operations. Adding with speed and accuracy is required of business people and can be achieved only through practice. The following brief review and drill will improve your addition skills.

A. DEFINITIONS

The numbers to be added are called the addends. The result of the addition is called the sum or total. Thus:

$$\left.\begin{matrix}36\\47\\28\end{matrix}\right\}\ \text{Addends}$$

$$111 \quad \text{Sum or Total}$$

B. POSITION

Our numbering system is positional; that is, the value of a digit depends upon the position it is in, as well as the value of the digit itself. For example, the numeral 4 in the rightmost column equals the number 4, while the numeral 4 in the second rightmost column equals 40. Therefore, when adding, it is necessary to arrange the numbers so that similar positional values fall in the same column. Where no decimals appear, all numbers should be aligned on the rightmost column.

ILLUSTRATIVE PROBLEM

Find the sum of:

127 + 3,746 + 12 + 923

SOLUTION

$$\begin{array}{r} 127 \\ 3{,}746 \\ 12 \\ 923 \\ \hline 4{,}808 \end{array} \quad \text{Sum}$$

PRACTICE PROBLEMS

1. $\begin{array}{r} 4172 \\ 37 \\ 426 \\ 583 \\ \hline \end{array}$

2. $\begin{array}{r} 81 \\ 419 \\ 653 \\ 76 \\ \hline \end{array}$

3. $\begin{array}{r} 28 \\ 2356 \\ 41 \\ 119 \\ \hline \end{array}$

C. COMBINATIONS OF 10

Most competent arithmeticians do not add a column in a number by number fashion. Instead, they pick out combinations of 10 which they recognize instantly. The following are the 2-number combinations of 10 which you should memorize. These should not require you to think $6 + 4 = 10$, but the numbers 6 and 4 should be thought of as 10 with no intermediate calculations.

1	2	3	4	5	or
9	8	7	6	5	

9	8	7	6	5
1	2	3	4	5

ILLUSTRATIVE PROBLEM

Add.

7
6
4
2
7
8

SOLUTION

Without using combinations totaling 10, you would normally think, 7, 13, 17, 19, 26, 34.

7 → 7
6 } 13
4 } 17
2 } 19
7 } 26
8 } 34
34

But by grouping into combinations totaling 10, you would think 7, 17, 27, 24. In other words, the steps in the addition would be as numbered below:

7 → Step 1-7
6
4) Step 2-17
2
7) Step 3-27
8) Step 4-34
34

While this method may be cumbersome at first, it is worthwhile developing. The authors estimate that 90 percent of all accountants add by using combinations of 10.

There are also many 3-digit combinations totaling 10 that should be instantly recognized. Some of these are:

1	1	1	1
1	2	3	4
8	7	6	5

2	2	2	2
1	2	3	4
7	6	5	4

3	3	3	3
1	2	3	4
6	5	4	3

4	4	4	4
1	2	3	4
5	4	3	2

PRACTICE PROBLEMS

1.	2.
312	416
463	379
738	694
267	386
849	724

3.	4.
126	984
368	126
984	378
742	188
866	732

D. PROVING ADDITION

Of the several ways of proving addition, reading in the opposite direction is by far the most common. If the original total was arrived at by adding the column from the top down, the proof would be accomplished by beginning at the bottom of the column and adding up and getting the same total.

Another method of proving addition is by reading the columns, writing the total of each column separately, and adding the subtotals (partial sums).

PRACTICE PROBLEMS

1.	2.
3,728	16,327
1,463	57,286
5,936	38,194
2,844	21,412
1,526	67,808
3,799	84,273

ILLUSTRATIVE PROBLEM

Add and prove

1,527
6,376
1,429
2,638
1,726
1,837
2,618
2,638
20,789

SOLUTION

Add each column separately.

1,527	
6,376	
1,429	
2,638	
1,726	
1,837	
2,618	
2,638	
59	(7+6+9+8+6+7+8+8)
23	(2+7+2+3+2+3+1+3)
45	(5+3+4+6+7+8+6+6)
16	(1+6+1+2+1+1+2+2)
20,789	

Note that each partial sum is indented one column.

E. BREAKING COLUMNS

It is frequently helpful to handle long columns by separating them into several parts, arriving at subtotals, and then adding the subtotals. This method may also be used as a proof.

ILLUSTRATIVE PROBLEMS

Add by dividing into subtotals.

3,726
4,816
2,978
1,523
3,729
1,866
4,637
2,619

SOLUTION

3,726	
4,816	
2,978	
1,523	
3,729	13,043 Subtotal
1,866	
4,637	
2,619	
	12,851 Subtotal
	25,894 Total

PRACTICE PROBLEMS

1. 1,273
   4,868
   3,729
   1,633
   2,788
   1,577

   Total

2. 3,896
   2,769
   3,728
   9,429
   3,768
   1,427

   Total

F. HORIZONTAL ADDITION

Frequently business forms present numbers to be added in horizontal rather than vertical form. To save the time required to relist these numbers vertically, business people often add horizontally.

ILLUSTRATIVE PROBLEM

127 + 638 + 476 + 788 + 372 = 2401

SOLUTION

This problem is solved in the same manner as vertical addition, that is:

1. Starting with the rightmost digits, add 7 + 8 + 6 + 8 + 2 = 31. Write the 1 and carry 3.
   ____1
2. Then add the second rightmost digits, 3 + 2 + 3 + 7 + 8 + 7 = 30. Write the 0 and carry 3.
   ___01
3. Then add the third rightmost digits 3 + 1 + 6 + 4 + 7 + 3 = 24. Sum = 2401

PRACTICE PROBLEMS

1. 786 + 375 + 682 + 747 =

2. 376 + 147 + 966 + 525 @ =

3. 472 + 638 + 395 + 716 =

G. ESTIMATING

A fairly close approximation of a solution may be obtained by rounding off the numbers to the nearest tens, hundreds, thousands and so on, and then adding the rounded-off numbers. If the digits to be dropped begin with 5 or more, add 1 to the rightmost digit retained. If the digits to be dropped begin with less than 5, do not change the rightmost digit retained. This can be done mentally.

ILLUSTRATIVE PROBLEM

27
52
36
48
68
24
12

SOLUTION

27 rounds off to	30
52 rounds off to	50
36 rounds off to	40
48 rounds off to	50
68 rounds off to	70
24 rounds off to	20
12 rounds off to	10
267	270
Actual	Approximate

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