MASON - LANGE - ROUSOS

MATHEMATICS FOR BUSINESS AND CONSUMERS

Mathematics for Business and Consumers (三版)

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Mathematics for Business and Consumers

To our wives:
Dorothy, Donna, and Irene

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Preface

Mathematics for Business and Consumers is a text-workbook designed primarily for a one-semester course in business mathematics offered in community colleges, technical colleges, junior colleges, and four-year colleges. It can be used in courses stressing both business and consumer mathematics or only consumer mathematics.

As in the first two editions, to exemplify the broad applications of mathematics in business, a large number of actual illustrations have been drawn from wholesale and retail establishments, banks, consumer finance companies, insurance firms, and manufacturers. The purpose of the textbook is to actively involve the student in the learning process.

Consumer mathematics is introduced early because in class-testing the book the authors discovered that students were highly motivated by such topics as consumer spending and income and deductions. There is no reason, however, why the chapters cannot be covered in any other sequence.

HIGHLIGHTS OF THIS EDITION

Behavioral Objectives. Each section has an objective indicating what the student will be able to do after completing the section.

Clear Explanations. Each section begins with a clear explanation of the topic. The topic is approached from a "real-world" point of view. This makes the material relevant for the student.

Problem-Solution. Each section has one or more sample problems followed by detailed solutions.

Calculators. The student is shown how to solve many of the sample problems using a calculator. These calculator solutions appear in the margin adjacent to the solutions given in the text.

Self-Review Problems. At various points in each section there are self-review problems which are designed to give students an opportunity to work problems similar to the sample problems. They serve to reinforce the student's understanding of the preceding material. Answers and methods of solution are given in the margin adjacent to the self-review problems.

Section Assignments. To further reinforce comprehension, there is an assignment set after each section. The answers and methods of solution for the odd-numbered problems are given in Appendix A. There is a large number of problems to allow the instructor a wide latitude when assigning them. Space is provided to show the method of solution. These sections are perforated and can be assigned by the instructor to be completed outside of class.

Chapter Review Assignment. There is a chapter review assignment at the end of each chapter. A wide assortment of problems covers all of the material in the chapter. These sections are also perforated but no answers are given.

Chapter Self-Review Test. A self-review test for every chapter is provided following the chapter review assignment. These allow students to evaluate their overall comprehension of the subject matter. Answers and methods of solution are given for all problems in Appendix A.

NEW FEATURES

Chapters have been rearranged at the suggestion of several adopters.

The chapter on banking services has been expanded and divided into two chapters: "Simple Interest" and "Banking Services."

The chapter self-review tests have been moved from the appendix to the end of

each chapter, thus making the material very accessible to the students. All answers are placed in Appendix A.

A number of computer programs in BASIC are presented to show how the computer can aid in routine calculations.

The insurance chapter has been expanded to include mobile home insurance.

The chapter on depreciation has been expanded to include the accelerated cost recovery system.

Problems have been updated in all sections to reflect current prices.

All tables, charts, graphs, and similar data have been updated.

ACKNOWLEDGMENTS

We are indebted to the reviewers for their helpful comments and suggestions. For the first edition these include Professors Robert J. Bishop, Macomb County Community College; John S. Campbell, San Jose City College; Robert Ochs, Miami Dade Community College, South Campus; Richard D. Godfrey, Grand Rapids Junior College; Steven C. Lawlor, Foothill College; Esther H. Highland, Queensborough Community College; Vik Shah, Lansing Community College; Charles Nichols, University of Toledo; and Dr. Murray P. Leavitt, De Anza College.

Many of the changes in the revised edition resulted from suggestions by students and professors too numerous to mention. However, we would particularly like to thank Paul Londrigan and the staff at C. S. Mott Community College, Arthur DeManty at Fresno City College, and Helen G. Scoon at Madison Area Tech College for their helpful suggestions based on their experience with the first edition. Special thanks to Alec Beaudoin (Triton College), John S. Campbell (San Jose City College), Frederick H. Janke (Tompkins-Cortland Community College), and Charles Nichols who read the entire manuscript and whose invaluable critique was reflected in that edition.

Many of the changes in the third edition resulted from suggestions from Kent R. Brigham, Madison Area Technical College, and Sue Dolan, Elizabeth Town College, as well as extensive, excellent, and much appreciated reviews by Dr. Louise Spivey, Golden West College, Virginia Brannan, Spokane Falls Community College, and Ira Wilsker, Lamar University. In addition, we wish to thank Donald Greco and Carla Christy for their assistance in writing solutions. We are also grateful to many insurance underwriters, bankers, retailers, and colleagues for their assistance in preparing specific portions of the manuscript. Finally, our appreciation to Donna T. Lange for her assistance.

Robert D. Mason
Walter H. Lange
Temoleon G. Rousos

A Note to the Student

This is not an ordinary textbook. It is constructed to aid you in your study by presenting the subject matter in small, easy-to-take steps with frequent checks to determine whether you fully understood the preceding material.

As you progress through each chapter you will be asked to fill in blanks or solve a problem. The answer to each **self-review** is always given. Following is an example.

Self-Review

Cover the answers in the left margin.

Susan and Kevin Carr are sales representatives. They receive a commission of \$0.55 for each box of greeting cards sold, \$1.15 for each set of memo pads, and \$0.85 for each child's deluxe coloring book. Complete the following:

A. Commission for 32 boxes of cards is: 32 × \$_____ = \$_____

B. Commission for 50 sets of memo pads is: _____ × \$_____ = \$_____

C. Commission for 564 coloring books is: _____ × \$_____ = \$_____

D. Total commision is: \$_____

Now verify your answers against those given in the margin.

A. 32 × \$0.55 = \$17.60

B. 50 × \$1.15 = \$57.50

C. 564 × \$0.85 = \$479.40

D. Total = \$554.50

There are **section assignments** after each section, if you need additional practice. The answers to odd-numbered problems, and the method of solution, are given in Appendix A.

Another distinctive feature of this text is the **Chapter Self-Review Test** with answers and method of solution. By completing this test you can better evaluate your comprehension of all of the material in the chapter.

Your instructor will probably assign the **review assignment** at the end of each chapter. The combination of (1) the many self-reviews in the chapter, (2) the section assignments, (3) the Chapter Self-Review Test, and (4) the chapter review assignments should aid you in mastering the subject matter.

R. D. M.
W. H. L.
T. G. R.

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1

A Brief Review of Basic Computations

SECTION 1–1 Computations with Whole Numbers and Decimals

When you have completed this section, you will be able to:
Add whole numbers and decimal numbers.
Subtract whole numbers and decimal numbers.
Multiply whole numbers and decimal numbers.
Divide whole numbers and decimal numbers.
Round whole numbers and decimal numbers.

ADDITION The operation of combining two or more numbers to give one number is called **addition.** The usual practice when adding is to align the numbers vertically.

Problem Several deposits to a checking account at the First National Bank were: $242.39, $3.08, $94.98, and $1,357.00. What is the total amount deposited?

Solution Write the numbers vertically; note that the decimal points must be aligned.

Deposit Date	*Amount Deposited*
	111 2
January 3.....	$ 242.39
January 8.....	3.08
February 27.....	94.98
April 9	1,357.00
Total.....	$1,697.45

The numbers in the extreme right column are summed first: That is, 9 + 8 + 8 + 0 = 25.

The 5 is entered in the total, and the 2 is *carried over* to the column to the left. The sum of that column, 2 + 3 + 0 + 9 + 0, is 14.

The 4 is entered in the total, and the 1 is carried over to the next column to the left.

This process is continued until all the columns have been totaled. The sum of the deposits is $1,697.45.

Using a calculator:

Enter	Press	Display
242.39	+	242.39
3.08	+	245.47
94.98	+	340.45
1357	=	1697.45

"Albert Einstein didn't do too badly, and he never had a pocket calculator!"

A NOTE TO THE STUDENT: As you progress through each chapter, there are self-review problems for you to solve. By actually doing each problem, you can determine *immediately* whether you have understood the preceding material. The answers to the problems are in the left margin. *Cover them before solving the problems.*

1 Self-Review

A. There were 18,000 murders, 42,000 forcible rapes, 386,000 robberies, and 365,000 aggravated assaults committed in the United States during one year, according to the Federal Bureau of Investigation. The total number of these violent crimes is _____.

A. 18,000
42,000
386,000
365,000
811,000

B. The Department of Interior, Bureau of Indian Affairs, reported on the number of persons living on Indian reservations in Oklahoma.

Reservation	*Number*
Creek	28,224
Cherokee	25,300
Choctaw	18,171
Osage	10,144
Chickasaw	7,700

What is the total number of persons living on Indian reservations in Oklahoma? _____.

B. 89,539

Now uncover the answers in the left margin and check your answers.

SUBTRACTION

The procedure for determining the difference between two amounts is called **subtraction.** The difference can be positive or negative.

Problems

A. To introduce its Doubleheader, Ponderosa reduced two big chopped steak dinners, including an all-you-can-eat salad bar, baked potato, warm roll with butter, and a cold drink, from $8.28 (for two persons) down to $5.99 with coupon. What is the total savings?

B. The balance in a checking account is $121.18. A check for $129.37 is written. What is the new balance?

Using a calculator:

Enter	Press	Display
8.28	−	8.28
5.99	=	2.29

Solutions

$$\begin{array}{r} \$8.28 \\ -5.99 \\ \hline \$2.29 \end{array}$$ difference

Note alignment of decimal points.

$$\begin{array}{r} \$121.18 \\ -129.37 \\ \hline -\$\ 8.19 \end{array}$$

To perform the subtraction it is easier to write:

$$\begin{array}{r} \$129.37 \\ -121.18 \\ \hline \$\ 8.19 \end{array}$$ difference

Balance is negative. Account is overdrawn.

Enter	Press	Display
121.18	−	121.18
129.37	=	−8.19

2 Self-Review

Cover the answers in the left margin before solving the following problems.

A. Merrill Lynch & Co. Inc., had earnings of $53,091,000 before income taxes for the third quarter. Income taxes were $20,643,000. The earnings after paying the income taxes were $ _____.

A. $53,091,000
−20,643,000
$32,448,000 earnings after taxes

B. K mart has the XG 7 Minolta camera with a f1.7 lens on sale for $268.00. The regular price is $329.88, according to an advertisement in the Sarasota (Florida) *Herald-Tribune.* What is the difference between the regular price of the XG 7 and the sale price? $ _____.

B. $329.88
−268.00
$ 61.88

Now uncover the answers in the left margin and check your answers.

Certain problems require that some numbers be added and others be subtracted to arrive at the total. To determine the total, the numbers to be added and subtracted are separated. Then:

Step 1. Find the total of the numbers to be added.
Step 2. Find the total of the numbers to be subtracted.
Step 3. Subtract the two totals. The answer can be positive or negative.

Problem Deposits and withdrawals in a new checking account at the City National Bank were: July 6, deposit $500.00; July 11, withdrawal $241.72; July 18, withdrawal $80.16; July 27, deposit $291.86; July 31, withdrawal $42.75. What is the total (called the *balance*) in the account at the end of July?

Solution

Deposits	*Withdrawals*	*End-of-Month Balance*
$500.00	$241.72	$791.86 deposits
291.86	80.16	−364.63 withdrawals
$791.86 total	42.75	$427.23 balance at end of July
	$364.63 total	

Using a calculator:

Enter	Press	Display
500	−	500
241.72	−	258.28
80.16	+	178.12
291.86	−	469.98
42.75	=	427.23

3 Self-Review

Northside Ford had 243 automobiles on the sales lot March 1. During March, 18 autos were received from the factory, and 52 were sold. In April, no cars were received from the factory, and 60 were sold. In May, 43 were received from the factory; 65 were sold. In June, 121 were received from the factory; 103 were sold. What was the total number of automobiles on the sales lot on June 30?

Separating the number received from the factory from the number sold to customers:

	On Hand	*Sold*
March 1	243	
March	18	52
April	0	60
May	43	65
June	121	103
Total	425	280

End-of-month balance:
425 − 280 = 145

On Hand and Received from the Factory		*Number Sold*			
On hand March 1	_____				
Received in March	_____	March	_____		
Received in April	_____	April	_____	Total on hand and received from factory	_____
Received in May	_____	May	_____	Total sold to customers	_____
Received in June	_____	June	_____	End-of-month balance	_____
Total	_____	Total	_____		

MULTIPLICATION

Multiplication can be viewed as repeated addition. For example, 3 × 7 is the same as 7 + 7 + 7 = 21. And 6 × 8 is the same as 8 + 8 + 8 + 8 + 8 + 8 = 48.

The answer to the multiplication of two numbers is called the **product.**

$$\begin{array}{rl} & 7 \leftarrow \text{multiplicand} \\ \text{multiply sign} \rightarrow & \times\ 3 \leftarrow \text{multiplier} \\ \hline & 21 \leftarrow \text{product} \end{array}$$

Obviously, if the problem involved multiplying 36 × 487, adding 487 + 487 + 487 . . . a total of 36 times would be very time-consuming. The alternative is to multiply the two numbers. (The smaller of the two numbers is usually placed underneath.)

Problem Find the product of 487 and 36.

Solution

Using a calculator:

Enter	Press	Display
487	×	487
36	=	17532

```
  487
× 36
 2922   ← 6 × 487
14610   ← 30 × 487
17532   ← the product
```

It should be noted that in multiplying 487 by 30, the 0 is usually omitted:

```
  487
× 36
 2922
1461    ← 0 was omitted
17532
```

If the multiplicand or multiplier (or both) *end* in zeros, the zeros may be ignored during the multiplication process. Then they are added on to the product. Examples:

```
 48700
×  36
 2922
1461
17532
```

Then two zeros are added.

The product is 1,753,200.

```
 48700
× 360
 2922
1461
17532
```

Then three zeros are added.

The product is 17,532,000.

In multiplying two numbers containing decimals, the *product must have as many decimal places as found in the numbers being multiplied.*

Problems

A. Determine the product of 1.035 and 2.61.

B. Determine the product of 2.013 and 6.7.

Solutions

Using a calculator:

Enter	Press	Display
1.035	×	1.035
2.61	=	2.70135

A.
```
Multiplicand   1.035   ← has three decimal places
Multiplier   × 2.61    ← has two decimal places
               1035
              6210
             2070
Product      2.70135
```

Has five decimal places counting from the right

B.
```
  2.013
× 6.7
 14091
12078
13.4871
```

Has four decimal places counting from the right

A.
```
  $46.25
×  1200
  9250
 4625
$55500
```

The product is $55,500.00

B.
```
   $4.88
×  26.5
   2440
  2928
   976
$129320
```

The product is $129.32.

4 Self-Review

A. Standard Oil of California common stock is selling on the New York Stock Exchange at $46.25 a share. An investor purchases 1,200 shares. Disregarding the commission paid, what is the total amount paid for the shares?

$ _____

B. Dacron voile is priced at $4.88 a yard. The total cost of 26.5 yards is:

$ _____

DIVISION

In a sense, **division** is the opposite of multiplication. Since $3 \times 7 = 21$, then $21 \div 7 = 3$, or $21 \div 3 = 7$. The answer to a division problem is called the **quotient.** Division can be shown several ways:

$$\frac{48}{6} \quad \text{or} \quad 48 \div 6 \quad \text{or} \quad 6\overline{)48}$$

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