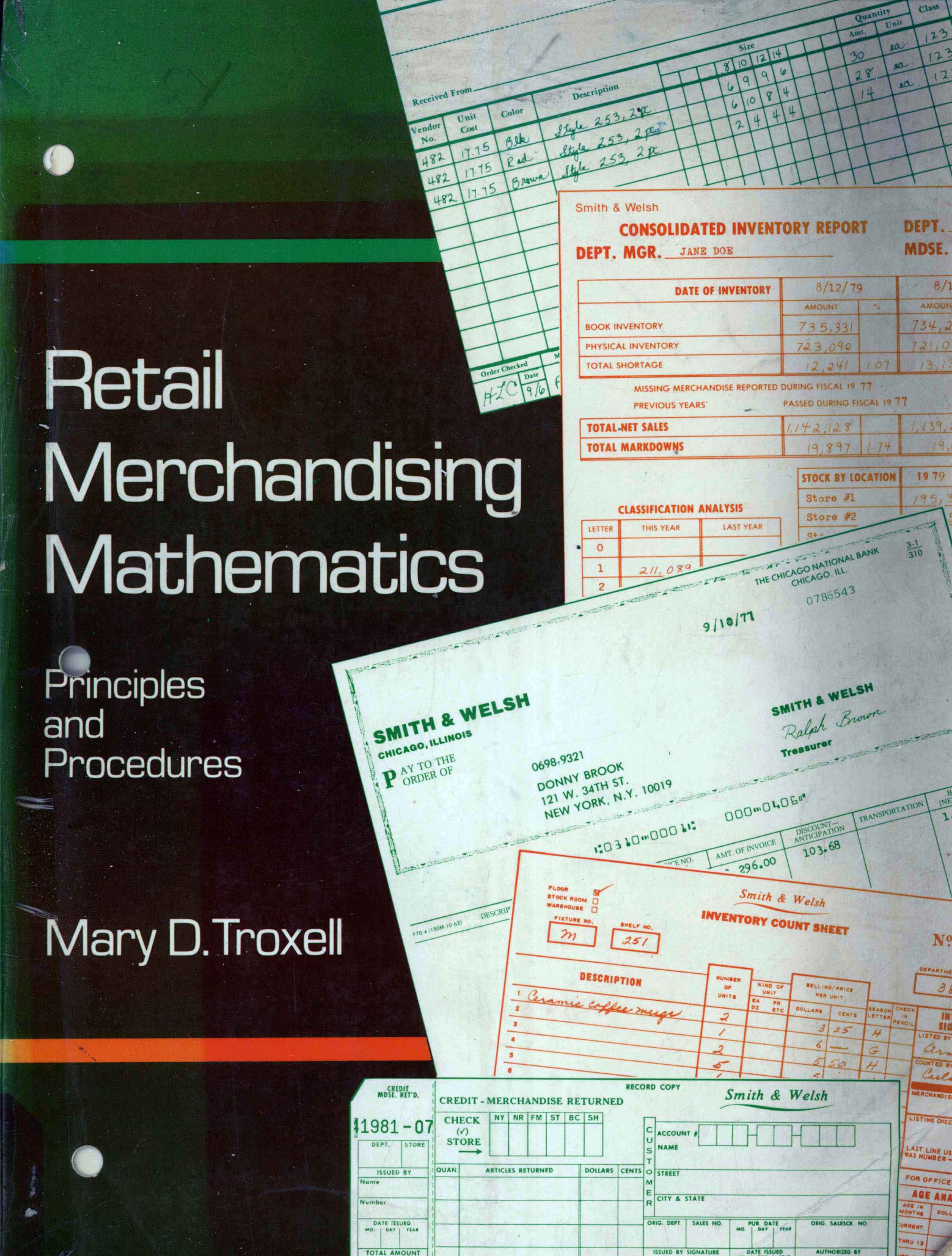

Retail Merchandising Mathematics

Principles and Procedures

Mary D. Troxell

RETAIL MERCHANDISING MATHEMATICS: principles and procedures

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PREFACE

The fundamental language of retail merchandising consists primarily of numbers and related figure facts such as dollars, units, and percentages. A basic knowledge of the mathematical interrelationship of profit factors, as these pertain to the day-to-day operation of a retail organization of any size, is essential to profitable merchandising. Recent studies have revealed that an alarming number of such mid-management merchandising, personnel as assistant buyers, buyers, and even merchandising managers are so lacking in merchandising mathematical competency as to render them incapable of solving all but the simplest of work-related problems. This is a sad commentary on the effectiveness of academic programs of merchandising study or retail store executive training and development programs.

Retail Merchandising Mathematics has been developed primarily to prepare career-oriented students for employment at such entry level merchandising positions in retail organizations as assistant buyer, assistant manager, or merchandising clerical. In addition, this book can serve as a guide in developing retail store junior executive training programs; it can provide, as well, an excellent procedural source of reference for young buyers with limited work experience, managers of chain units, or merchants who operate small independent stores.

The major purposes of this text are to introduce students to retail merchandising principles and terminology; provide them with the basic merchandising equations and other arithmetic calculations frequently used in the merchandising operations; acquaint them with the various principles, practices, and techniques employed by retail merchants in the planning and control of their stock assortments; instruct them in the use and function of typical retail store merchandising forms and reports; and help them develop a degree of competency in applying basic mathematical formulas to the solving of merchandising problems.

The contents of this book are realistic because they are based on the author's considerable personal experience as a buyer and merchandiser in medium- to large-volume retail organizations; her personal experience as a professor and coordinator of retail merchandising programs of study in both two- and four-year colleges; the opinions and advice of the many

retail executives with whom the author has maintained close, professional working relationships; the fact that all material has been thoroughly class-tested; and the favorable comments of students, graduates, faculty associates, and reviewers.

Retail Merchandising Mathematics has been developed as a text or *handbook,* with the added advantages of a *workbook.* In each chapter, after a major topic has been introduced and discussed, practice problems that test the students' understanding of that particular topic are presented. At the end of each chapter new terms are listed in a Summary of Key Terms and their definitions are restated. Also at the conclusion of each chapter are objective and short answer Review Questions, followed by Review Problems, each with workspace for the calculation of answers. The pages on which the Review Questions and Problems appear may be removed when completed, handed in for grading purposes, and later replaced in the book for study and reference.

In the first of the ten chapters there is a brief and thorough review of decimals and percentages, with related practice exercises. Accuracy in handling these arithmetic concepts is an absolute essential in arriving at correct merchandising calculations. The second chapter serves as an introduction to the retail merchandising function, exploring various sizes and types of stores and their organization for carrying out the merchandising activity. Responsibilities of personnel in the Merchandising Division and important staff aides to that Division are also discussed here. Succeeding chapters explore fundamental retail merchandising principles and procedures in sequential learning order, starting with the Seasonal Merchandise Plan and concluding with periodic financial and managerial reports on the merchandising operation.

An Instructor's Manual, including solutions to Practice and Review Questions and Problems, a diagnostic test, arithmetic review test, and midterm and final examination complete with answers, is available.

The author wishes to express her appreciation of the help she has received from many people in the preparation of this text-workbook. Thanks go to business and academic associates who generously shared their valuable time, materials, and experience. Special thanks must go to the hundreds of students who field-tested experimental versions of this text and whose enthusiastic response and interest provided the incentive needed to complete it.

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CHAPTER 1

REVIEW OF ARITHMETIC

Mathematics is the science of numbers and measurements in terms of figures. It is a science that must be thoroughly mastered by anyone who wants a career in merchandising. Merchandise planning and evaluation are done almost completely in the language of numbers.

Today, various calculating machines and mechanical devices are used by business organizations to handle mathematical calculations. All those calculators and devices do, however, is the routine counting work. They do not think. Thinking will always remain the responsibility of people.

To be a good merchandiser, you must know the fundamentals of arithmetic. Only when you can handle whole numbers, fractions, decimals, and percentages rapidly, accurately, and confidently will you be able to think and work efficiently in this field. Although you may have already mastered these various types of arithmetic calculations, a quick review of decimals and percentages, which are widely used in merchandising calculations, may help you sharpen your skills and improve your speed.

Here are some tips. For maximum accuracy in arithmetical calculation, write each number clearly and distinctly; do not take the chance of making a mistake by being unable to read your own handwriting or of others being unable to read it. Make sure that you write the numbers of a problem in their proper position: addition, subtraction, and multiplication problems are usually figured vertically, with the numbers lined up on the right-hand side; division problems are usually figured horizontally; decimal points are placed according to specific rules. Simple tips, yes—but even simple mistakes in arithmetic can be very expensive both to you and to your store.

DECIMALS

A *decimal* is a fraction whose denominator is some power of 10 (10, 100, 1,000, etc.) and which is signified by a decimal point placed at the left of the first figure of the number. For example:

$$.1 = \frac{1}{10}$$

$$.01 = \frac{1}{100}$$

$$.001 = \frac{1}{1{,}000}$$

$$.0001 = \frac{1}{10{,}000}$$

The decimal point separates a whole number from a part of that whole number expressed as some power of 10. For example, 1.15 equals 1 and 15/100s of 100. In U.S. currency, where pennies represent hundred parts of a dollar (100 pennies equal one dollar), $1.15 means one dollar and 15/100s of a second dollar, or one dollar and fifteen cents.

Adding Decimals

To add decimals, place the numbers to be added in vertical columns, with each decimal point directly below the one in the number above it. It is the decimal points that must be aligned in a straight row, not the right-hand side of the figures, as in addition of whole numbers. Draw a horizontal line beneath the last number in the column. Put the answer beneath this line, with the decimal point of the answer being placed directly below that of the decimal points of the numbers that have been added.

Problem:		**Notes:**
2.42 .4 11.8 + 2.587 17.207	2.420 .400 11.800 + 2.587 17.207	Align figures so that all decimal points are in a straight vertical line. Then add up the figures just as though there were no decimal points. To avoid possible errors because of the placement of the numbers, zeros can be placed after the numbers so that they all align on the right, as per the example at the immediate left.

To prove the accuracy of your calculation, use the same method that is used to prove a calculation in the addition of whole numbers, that is, by adding the figures in the opposite direction.

Subtracting Decimals

To subtract decimals, first write down the larger number. Then put the smaller number (the one to be subtracted) directly under the larger number, lining up the decimal points in a vertical line. Draw a horizontal line under the second number. Calculate as you would in a problem involving whole numbers, and indicate the remainder under the line—putting the decimal point in the remainder directly below those above the line.

Problem:

$$\begin{array}{r} 19.49 \\ -\ 8.6431 \\ \hline 10.8469 \end{array} \qquad \begin{array}{r} 19.4900 \\ -\ 8.6431 \\ \hline 10.8469 \end{array}$$

Notes:

As in the addition of decimals, zeros can be added to the right of the decimal points to make this calculation more accurate. This has been done in the example immediately to the left. Adding zeros in this way does not change the value of the numbers in any way.

To prove the accuracy of your calculation, use the same method that is used to prove a calculation in the subtraction of whole numbers; that is, by adding the difference figure to the smaller number (the one being subtracted) the answer should be the first or larger number, as in this example:

$$\begin{array}{r} 10.8469 \\ +\ 8.6431 \\ \hline 19.4900 \end{array} \quad \text{or} \quad 19.49$$

PRACTICE PROBLEMS—Adding and Subtracting Decimals

1. Add each of the following (use separate sheet for figuring):

   (a) .25, .75, .374, .625, .03 = _____

   (b) 3.75, 28.2, .087, 14.7891 = _____

   (c) .012, 1.34, 12.989, 141.3, .375 = _____

   (d) .125, .2875, 1.47, 24.9, 9.009 = _____

   (e) 493.6, 2.901, .43, .975, 14.75 = _____

2. Subtract each of the following (use separate sheet for figuring):

   (a) 9.45 from 11.00 = _____

   (b) 247.59 from 9,421.63 = _____

   (c) .1322 from 5.62 = _____

   (d) .093 from .1203 = _____

   (e) 4.697 from 6.2433 = _____

Multiplying Decimals

To multiply decimals, write down the figures just as though you were putting down a multiplication problem in whole numbers. Do not try to align the decimal points. Calculate the problem as though it were a problem in whole numbers. Then, after you have obtained

an answer, add together the number of places to the right of the decimal point in the multiplicand (first number) and the number of places to the right of the decimal point in the multiplier (second number). This total is the number of places that the decimal point should be placed to the left in the answer.

Problem:

$$\begin{array}{r} 3.24 \\ \times \quad .75 \\ \hline 1620 \\ 2268 \\ \hline 2.4300 \end{array} \quad \text{or } 2.43$$

Notes:

The decimal point is two places to the right in the multiplicand, and two places to the right in the multiplier. This means that the decimal point is placed 4 places to the left of the last figure in the answer (product).

To prove the accuracy of your calculation, use the same method that is used to prove a calculation in the multiplication of whole numbers. Since this involves using division, read the section about dividing decimals before trying to prove a multiplication problem in decimals.

$$2.43 \div .75 = .75\overline{)2.43.00} \quad \text{quotient } 3.24$$

$$\begin{array}{r} 225 \\ \hline 180 \\ 150 \\ \hline 300 \\ 300 \\ \hline \end{array}$$

PRACTICE PROBLEMS—Multiplying Decimals

Multiply each of the following sets of figures in the space provided.

1. (a) $\$3.20 \times 4$ (b) $\$19.75 \times 7$ (c) $\$201.90 \times 14$ (d) $\$285.10 \times 12$ (e) $\$19.03 \times .43$

2. (a) $24.6 \times .4$ (b) 8.76×2.6 (c) $2.041 \times .07$ (d) $6.257 \times .11$ (e) $876 \times .27$

3. (a) 24.628×97.5 (b) $.21364 \times 9.6$ (c) 2.69×12.3 (d) 1.064×78.2 (e) $1.0004 \times .205$

4. (a) $\$425.00 \times 37$ (b) $\$412.92 \times 16$ (c) $\$39.33 \times 4$ (d) $\$81.54 \times 13$ (e) $\$810.14 \times 7$

Dividing Decimals

To divide a decimal by a whole number, proceed as in regular division, being sure to place the decimal point in the answer space directly above the decimal point in the number to be divided, as in this example:

$$12.75 \div 15 = 15\overline{)12.75}$$

.85
12.0
75
75

To divide a decimal by a decimal, proceed as in regular division, with one additional step: move any decimal point in the divisor (the dividing number) to the right of its last number, then move the decimal point in the dividend the same number of places to the right, adding zeros as necessary.

To prove the accuracy of your calculation, use the same method that is used to prove a calculation in the division of whole numbers—that is, multiply the answer by either the divisor or dividend, and you should get the remaining figure.

$$12.75 \div 1.5 = 1.5.\overline{)12.7.50}$$

.85
120
75
75

PRACTICE PROBLEMS—Dividing Decimals

Divide each of the following (use separate sheet for figuring):

(a) $24.72 by 8 = _____

(b) $196.92 by 9 = _____

(c) 25.0047 by 7 = _____

(d) $576 by .006 = _____

(e) $4,215 by .15 = _____

(f) .31552 by 4.64 = _____

(g) 642.812 by 321.406 = _____

(h) $96.48 by .75 = _____

(i) $174.96 by 1.44 = _____

(j) $2,671.38 by .051 = _____

PERCENTAGES

A *percentage* is a part or specified number of parts of 100 when 100 is considered the whole or base figure. Percentage is indicated by a percent sign: %.

Percentages are used frequently in all kinds of business dealings. Discounts, interest, commissions, and taxes are all expressed in percentages. Percentages are particularly useful for making comparisons. In retail merchandising, net sales or net income is frequently used as the base figure, and costs of goods, expense of operations, and amount of profit are expressed as percentages of that base figure. Then relationships between current figures can be checked against past and planned figures to give the merchant a detailed picture of the state of his/her business as compared to last year and/or plan.

Percentages are added, subtracted, multiplied, and divided in exactly the same way that decimals are. Since percentages are parts of 100, the same rules that apply to the placement of the decimal point in calculating decimals apply to the placement of the percentage point in calculating percentages. The only difference is that a percent sign is always used in the answer.

Therefore, instead of discussing addition, subtraction, multiplication, and division, this section will concentrate on the several common calculations involving percentages.

Converting Percentage into a Fraction or Decimal

1. To change a percentage into a fraction, first remove the percent sign, divide the percent number by 100, and then reduce the resulting fraction to its lowest terms. For example:

$$60\% = 60 \div 100$$
$$= \frac{60}{100}$$
$$= \frac{3}{5}$$

2. To change a percentage to a decimal, first remove the percent sign and then move the decimal point *two places to the left,* adding or subtracting zeros as needed. For example:

$$50\% = 50/100\text{s}$$
$$= .50$$
$$= .5$$

3. To change a fractional percentage to a decimal, first change the fractional percentage into its equivalent decimal percentage. Then change the decimal percentage to a regular decimal as in the preceding paragraph. For example:

$$3/5\% = .6\%$$
$$= .006$$

Note: "3/5%" is three-fifths of one part of 100. It is only 6/1,000 of the whole.

Converting a Decimal or Fraction into Percentage

1. To change a decimal into a percentage, move the decimal point *two places to the right,* adding zeros as necessary, and add the percent sign. For example:

$$.05 = 05.$$
$$= 5\%$$

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