Workbook of solutions and dosage of drugs

INCLUDING ARITHMETIC

ANDERSON/VERVOREN

TENTH EDITION

Workbook of solutions and dosage of drugs

INCLUDING ARITHMETIC

ELLEN M. ANDERSON, R.N., B.S., M.A.

Formerly Director, School of Nursing, Columbia Hospital, Milwaukee, Wisconsin; Educational Director and Instructor, Northwestern Hospital School of Nursing, Minneapolis, Minnesota; Educational Director, Methodist Hospital School of Nursing, Indianapolis, Indiana

THORA M. VERVOREN, R.Ph., B.S.

Director, Pharmacy Service, Columbia Hospital, Milwaukee, Wisconsin; Instructor in Pharmacology, Columbia Hospital School of Nursing, Milwaukee, Wisconsin

TENTH EDITION

The C. V. Mosby Company

Saint Louis 1976

TENTH EDITION

Printed in the United States of America

CB/CB/B 9 8 7 6 5 4 3

WORKBOOK OF SOLUTIONS AND DOSAGE OF DRUGS

INCLUDING ARITHMETIC

PREFACE

As in previous editions this workbook is primarily designed for students in nursing. The purpose is to provide a means by which students can develop abilities necessary to safely participate in that area of patient care relating to drug therapy. Also it is useful as a reference for members of the nursing staff.

The review of arithmetic presented includes basic skills and activities to stimulate recall. Since abilities of individual students within the group differ, the arithmetic area has been arranged so that it can be used as a self-directed precourse or as an outline of class assignment.

Suggestions for improvement and criticisms made by instructors using the workbook were studied and, insofar as possible, utilized in the revision. New material has been added to the dosage section and greater emphasis placed on the metric system of measure. Some areas have been combined, reorganized, or deleted. New problems and exercises have been provided in many areas.

We wish to express appreciation to instructors and students who use the book, and to Margaret Zweck and Cheryl Kramer for typing the revision.

Ellen M. Anderson

Thora M. Vervoren

CONTENTS

PART ONE

ARITHMETIC AND MEASURES

Review of common arithmetic terms

Addend Any one of the numbers to be added in an addition problem.

Approximate A "nearly correct" answer, not necessarily the exact answer.

Common denominator A number that is evenly divisible by all the denominators of two or more fractions.

Decimal An abbreviation for a fraction with a denominator of 10, 100, 1000, and so on. Only the numerator of the fraction is written. The location of the decimal point shows what the denominator is.

Denominator The term below the fraction line in a fraction. It tells into how many parts a whole quantity is divided.

Difference The answer to a problem in subtraction.

Digit Any of the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. The number 6789 has four digits: 6, 7, 8, 9.

Dividend The number that is to be divided in a division problem.

Divisor The number by which the dividend is divided in a division problem.

Equivalent Equal to.

Factor Any one of the numbers to be multiplied in a multiplication problem.

Fraction A numeral representing the parts being considered out of a total number of parts in a whole quantity, for example, 1/5 represents one of five equal parts of a whole quantity.

Improper fraction A fraction in which the numerator is equal to or greater than the denominator.

Integer A whole number.

Invert To turn "upside down."

Lowest common denominator The smallest number that is evenly divisible by the denominator of two or more fractions.

Minuend The number from which another number is subtracted.

Mixed number A number consisting of an integer (whole number) and a fraction.

Multiplicand The number which is multiplied in a multiplication problem.

Multiplier The number "multiplied by" in a multiplication problem.

Numeral A name or symbol which represents a number.

Numerator The part of a fraction that is above the line. It tells the number of parts of the divided unit that is being considered.

Percent A fraction whose numerator is expressed and whose denominator is understood to be 100. The symbol % indicates percent.

Product The answer to a multiplication problem.

Proper fraction A fraction whose numerator is less than its denominator. Also called simple or common fraction.

Proportion Consists of two ratios that are equal to each other.

Quotient The answer to a division problem.

Ratio The relationship of one quantity to another. It indicates division.

Segment A part of a whole quantity.

Subtrahend The number that is subtracted in a subtraction problem.

Sum The result of simple addition.

Symbol A letter or mark representing a number, a quantity, an operation, etc.

Term Any of the parts composing a fraction, a proportion, or a ratio.

Unit A whole quantity.

CHAPTER 1

The system of numbers

The history of the system of numbers is assumed to go back in time before recorded history. Each country had its own system, and as communications and exchange of goods between peoples increased, the need for a common system of numbers increased. The system of numbers with which we are familiar is derived from the early systems of the Arabians, Hindus, Babylonians, Assyrians, Egyptians, and tribes unnamed in history.

The early system of notation was largely a system of counting. This type of notation was similar to our whole number. In time another kind of notation made its appearance. It was used in designating a part of a whole and was called a broken number or fraction. Earliest history of a broken number or fraction comes from the Egyptians and Babylonians. As the system of notation developed, the Greeks followed the Egyptian system of fractions and the Romans the Babylonian system of fractions. By the end of the sixteenth century the surviving systems of numbers were the Arabic and Roman.

THE ARABIC SYSTEM OF NOTATION

Arabic numerals are 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

The Arabic system has surpassed and supplanted all other systems because it is simple and versatile. A numeral expresses a number and a combination of numerals expresses other numbers. Each numeral has a place value beginning from right to left. In a number such as 245, 5 is in the one's place expressing 5 ones; 4 is in the ten's place expressing 4 tens; 2 is in the hundred's place expressing 2 hundreds. Successive numerals occupy a place whose value is ten times as much as the preceding one.

Another advantage of the Arabic system is that it is readily adapted to use with broken numbers or fractions. This is indicated by the numerals to the right of one's place. The separation of whole numbers, a broken number, or fraction is indicated by a symbol. The most common is the decimal point.

The four basic processes of computation—addition, subtraction, multiplication, and division—can be carried out in the Arabic system.

THE ROMAN SYSTEM OF NOTATION

The Romans used letters to designate numbers. This restricts the system's usefulness, since there is no way to indicate processes in arithmetic such as division or multiplication. Roman numerals are sometimes used on dials of clocks and watches, for dates, especially on public buildings, and to head chapters in books. In hospitals Roman numerals are used in the apothecaries' system of measures in writing prescriptions and dosage of drugs.

Basic Roman numerals are expressed by seven capital letters as follows:

Roman numeral	*Arabic equivalent*
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

$\overline{D}$ = 5000, and $\overline{M}$ = 10,000, but these are seldom used.
Roman numerals also may be expressed in lower case letters.

When Roman numerals are used to write dosage of drugs and prescriptions, the numerals are expressed in lower case letters. The most commonly used lower case Roman numerals are as follows:

Roman numeral	*Arabic equivalent*
i	1
v	5
x	10
l	50

A combination of Roman numerals expresses other numbers.

Rule I—addition indicated

1. When a numeral of lesser value follows one of greater value.
2. When numerals of the same value are repeated in sequence. However, numerals are never repeated more than three times in a sequence.

EXAMPLES:

1. VI = 5 + 1 or 6
   XV = 10 + 5 or 15
2. II = 1 + 1 or 2
   III = 1 + 1 + 1 or 3
   XXX = 10 + 10 + 10 or 30

Rule II—subtraction indicated

1. When a numeral of lesser value precedes one of greater value.
2. When a numeral of lesser value is placed between two of greater value, the numeral of lesser value is subtracted from the numeral following the one of lesser value.

EXAMPLES:

1. IV = 5 − 1, or 4
   IX = 10 − 1, or 9
   XL = 50 − 10, or 40
2. XIV = 10 + 5 − 1, or 14
   XXIX = 10 + 10 + 10 − 1, or 29
   MCMLVI = 1000 + 1000 − 100 + 50 + 5 + 1, or 1956

Exercises

Name______________________________

Date ______________________________

1. Write the following Arabic numerals as basic Roman numerals:

99	________	400	________
100	________	60	________
40	________	210	________
30	________	950	________
1550	________	27	________
656	________	85	________
504	________	56	________
1975	________	259	________

2. Write the following Roman numerals as Arabic numerals:

MM	________	DCC	________
CDLV	________	DCL	________
LVII	________	DCX	________
XC	________	CCL	________
CX	________	IV	________
XIV	________	VI	________
XVII	________	IX	________
XXXIII	________	XI	________
L	________	XX	________
VC	________	LXXXIX	________

3. Write the following Arabic numerals as lower case Roman numerals:

7	________	14	________
3	________	51	________
22	________	4	________
19	________	18	________
1061	________	150	________

4. Write the following lower case Roman numerals in Arabic numerals:

xii	________	ii	________
xxiv	________	ix	________
lxv	________	xxx	________
xl	________	lxxi	________
cxli	________	xxxv	________

CHAPTER 2

Fractions and ratio

A fraction is a number that indicates division. In a simple form it expresses one or more equal parts into which a unit is divided.

EXAMPLES:

$\frac{1}{3}$ is one part of a unit that is divided into three equal parts.

$\frac{2}{7}$ is two parts of a unit that is divided into seven equal parts.

$\frac{3}{8}$ is three parts of a unit that is divided into eight equal parts.

The **numerator** is the dividend, or the number above the line. It tells how many parts of the divided unit are taken.

The **denominator** is the divisor, or number below the line. It tells into how many parts the unit is divided.

The numerator and denominator are called the **terms** of a fraction.

EXAMPLE: $\frac{2}{5}$ 2 is the numerator
5 is the demominator 2 and 5 are the terms.

As the denominator of a fraction increases, the value decreases if the numerator remains the same.

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{10}, \frac{1}{20}$$

The fractions in this series are from greater to lesser value. It is possible to add, subtract, multiply, and divide fractions in the same manner as whole numbers.

KINDS OF FRACTIONS

1. A **proper fraction,** often called a simple or common fraction, is a fraction in which the numerator is smaller than the denominator. It is less than one unit.

EXAMPLES: $\frac{1}{4}, \frac{7}{9}, \frac{2}{3}$

2. An **improper fraction** is a fraction in which the numerator is equal to or greater than the denominator. It is equal to one unit or more than one unit.

EXAMPLES: $\frac{3}{2}, \frac{11}{3}, \frac{8}{8}$

3. A **mixed number** is a whole number and a fraction. Its value is always more than one unit.

EXAMPLES: $2\frac{1}{9}, 8\frac{6}{7}$

4. A **complex fraction** is a fraction in which the numerator or the denominator is a fraction, or the numerator and denominator are both fractions.

EXAMPLES: $\frac{5}{1/2}, \frac{1/2}{5}, \frac{2/3}{5/6}$

In these fractions 5, 1/2, and 2/3 are the numerators; 1/2, 5, and 5/6 are the denominators.

LIKE AND UNLIKE FRACTIONS

Fractions whose denominators are alike, such as $\frac{2}{7}, \frac{3}{7},$ and $\frac{5}{7},$ are called **like fractions.**

Fractions whose denominators are unlike, such as $\frac{1}{3}, \frac{1}{4},$ and $\frac{2}{5},$ are called **unlike fractions.**

Like fractions can be added, subtracted, multiplied, and divided.

Unlike fractions can be multipled and divided. Therefore when addition or subtraction of unlike fractions is indicated, it becomes necessary to change the unlike fractions to like fractions. The change results in a new fraction, different in form but equal to the original fraction, which is called an equivalent fraction.

EQUIVALENT FRACTIONS

The equivalency of fractions is based on a fundamental principle in computing with fractions: *Multiplying or dividing both terms of a fraction by the same number does not change its value.*

Computing with fractions depends on this principle. Multiplying or dividing both terms of a fraction by the same number results in another fraction of the same value and is called an **equivalent** fraction.

EXAMPLES:

1. Multiply both terms of $\frac{3}{4}$ by 2; by 4:

$$\frac{3 \times 2}{4 \times 2} = \frac{6}{8} \qquad \frac{3 \times 4}{4 \times 4} = \frac{12}{16}$$

The resulting fractions $\frac{6}{8}$ and $\frac{12}{16}$ are equal to $\frac{3}{4}$ and to each other.

When both terms of a fraction are multiplied by the same number, the terms of the new fraction are **larger** than the terms of the original fraction.

2. Divide both terms of the fraction $\frac{12}{16}$ by 4; $\frac{6}{8}$ by 2.

$$\frac{12 \div 4}{16 \div 4} = \frac{3}{4} \qquad \frac{6 \div 2}{8 \div 2} = \frac{3}{4}$$

The resulting fraction $\frac{3}{4}$ is equal to $\frac{12}{16}$ and $\frac{6}{8}$; therefore $\frac{12}{16}$ and $\frac{6}{8}$ are equal to each other.

When both terms of a fraction are divided by the same number, the terms of the new fraction are **smaller** than the terms of the original fraction. A fraction changed to its smallest terms simplifies computing by reducing the possibility of errors and by saving time. The process of changing the terms of a fraction to smaller terms is known as *reducing a fraction to its lowest terms.*

CONVERSION OF UNLIKE FRACTIONS

There are several methods by which two or more unlike fractions can be converted to like fractions. One method consists of the following two steps: (1) Find the lowest multiple that will be common to the denominators of the fractions under consideration, and (2) convert each original fraction to an equivalent fraction having the lowest common multiple as the denominators.

Step I

To find the lowest multiple that will be common to the denominators of unlike fractions, divide all the numbers in the denominators of the fractions by a factor that is common to two or more of them and that will divide into them evenly; continue until no two numbers in the quotient are divisible by the same number. Multiplying all the divisors and the remaining numbers greater than one results in the least common multiple (LCM).

EXAMPLE: In the fractions $\frac{2}{3}$, $\frac{3}{5}$, $\frac{5}{6}$, and $\frac{1}{12}$ the LCM of the denominators is 60. Therefore 60 will be the denominator of the equivalent fractions.

$$\begin{array}{r|l} 3 & 3 - 5 - 6 - 12 \\ \hline 2 & 1 - 5 - 2 - 4 \\ \hline & 1 - 5 - 1 - 2 \end{array}$$

$$3 \times 2 \times 5 \times 2 = 60 \text{ (LCM)}$$

Step II

To obtain the numerators of the equivalent fractions, multiply each original fraction by the LCM obtained in Step I. Place the product over the LCM.

EXAMPLE: Change $\frac{2}{3}$, $\frac{3}{5}$, $\frac{5}{6}$, and $\frac{1}{12}$ to equivalent fractions with a denominator of 60.

$$\frac{2}{\cancel{3}} \times \overset{20}{\cancel{60}} = 40 \qquad \frac{3}{\cancel{5}} \times \overset{12}{\cancel{60}} = 36 \qquad \frac{5}{\cancel{6}} \times \overset{10}{\cancel{60}} = 50 \qquad \frac{1}{\cancel{12}} \times \overset{5}{\cancel{60}} = 5$$

Placing the product over the denominator gives the equivalent fraction.

$$\frac{2}{3} = \frac{40}{60} \qquad \frac{3}{5} = \frac{36}{60} \qquad \frac{5}{6} = \frac{50}{60} \qquad \frac{1}{12} = \frac{5}{60}$$