

Preface

To the Instructor

Math and Dosage Calculations for Medical Careers is organized into 12 chapters, along with a pretest and a comprehensive evaluation, or posttest.

The **Pretest** gives the students an opportunity to review the basic math skills they will need for the book. The content of the Pretest parallels much of the content of Chapters 1 and 2.

Chapter 1, Fractions and Decimals, provides a comprehensive review of fractions and decimals. These are the basic building blocks for all that follows.

Chapter 2, Percents, Ratios, and Proportions, continues the math review by introducing percents, ratios, and proportions. The concept of solution strengths for both dry and liquid medication is also introduced. In both Chapters 1 and 2, word problems draw on medical settings.

Chapter 3, Systems of Weights and Measures, reviews weights and measures. It introduces the metric system as well as apothecary and household systems. Time and temperature conversions are included. Special attention is given to conversion factors, and the procedures for ratio proportion, fraction proportion, and dimensional analysis methods are introduced as building blocks for later chapters.

Chapter 4, Equipment for Dosage Measurement, covers the equipment used to measure and administer medications. It looks first at equipment used for oral administration, then at hypodermic syringes, and finally at other means of delivering medication, including transdermal patches.

Chapter 5, Drug Orders, begins with the Seven Rights of Medication Administration and then shows the various ways in which drug orders may be written. It emphasizes safety and shows how drug orders can easily be misread.

Chapter 6, Drug Labels and Package Inserts, teaches the students how to find a wide range of information common to all drug labels and then specifically to oral and parenteral medications. A discussion of dosage strength is provided as a building block for later calculations.

Chapter 7, Methods of Dosage Calculations, teaches the techniques for calculating doses. Building on information from earlier chapters, students are taught how to calculate the amount to administer, using all four methods of dosage calculations including ratio proportion, fraction proportion, dimensional analysis, and the formula method. Students should be encouraged to explore the four methods and determine which they understand the best and want to continue to use as their method of choice for later chapters.

Chapter 8, Oral Dosages, discusses tablets and capsules in depth and gives information about breaking or crushing them. Liquid oral medications are also discussed. The methods of dosage calculations introduced in Chapter 7 are applied and color-coded throughout the chapter.

Chapter 9, Parenteral Dosages, applies techniques learned in Chapter 7 to calculations of parenteral dosages, emphasizing injectable medications. The chapter concludes with a look at other parenteral medication routes such as inhalants, rectal, and transdermal systems.

Chapter 10, Intravenous Dosages, presents information and calculations unique to administering intravenous medications. After introducing IV solutions and equipment, we turn our attention to calculating flow rates for electronic and manual regulation. Students also learn calculations for adjusting the flow rate, infusion times, and infusion volumes.

Chapter 11, Calculations for Special Populations, includes drug orders based upon body weight. It introduces body surface area (BSA) calculations. Discussions of special concerns for pediatric and geriatric patients with regard to daily maintenance fluid needs are included. Creatinine clearance, the relationship between ideal and actual body weights, and polypharmacy are also presented.

Chapter 12, Specialized Calculations, includes additional information and calculations related to insulin, heparin, critical care IV, and solutions, solids, and compounds. Students are familiarized with insulin syringes, heparin administration, titrations, and alligations.

A **Comprehensive Evaluation** or posttest is available after Chapter 12 for the student's review.

Features of the Textbook

The second edition of *Math and Dosage Calculations for Medical Careers* keeps many of the well-liked features from the first edition but adds new features to make the content user-friendly. Updated features from the first edition include these:

- **20 Error Alert** boxes point out common errors and focus on avoiding them and calculating correctly.
- **Rules** state the important formulas and facts. **Examples** that follow illustrate the rules.
- **8 Patient Education** boxes teach students clear and accurate communication with their patients.
- **29 Critical Thinking on the Job** boxes help student relate what they are learning to the health care profession and to their role as health care professionals.
- **31 Tables** concisely summarize key information including the most up-to-date “Do Not Use” and “Undesirable” abbreviations according to the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).
- **Critical Thinking Applications** sections encourage students to problem-solve and use higher-level thinking to answer questions related to actual health care practice.
- **Case Studies** provide questions to be solved base on real-world practice situations.
- **Internet Activity** boxes direct the student to factual content and resources and stimulate the use of the Internet as a professional tool.

What's New to the Second Edition

- **Four methods of dosage calculations Fraction-Proportion, Ratio Proportion, Dimensional Analysis, and Formula** are introduced together and used throughout the textbook. Each method is identified by a different color for easy reference.
- Pocket-size dosage calculation **reference cards**
- Chapter **introduction, key terms, and quotations** are used as an advance organizer or anticipatory set for each chapter.
- Includes over **250** full-color, up-to-date **drug labels** currently used by the health care profession. (Some of the labels have been enlarged or made smaller for clarity and design purposes.) Labels provide realistic learning.
- Additional **Review and Practice** problems for every section.
- **CD-ROM references** throughout that direct the student to exercises and provide for independent review, reinforcement, and evaluation.
- **Link feature** refers the student to an earlier chapter for a quick review when concepts are repeated.
- Up-to-date **Glossary with pronunciations** on the student CD-ROM.

Feature List

TABLES

Number	Name	Page #
1-1	Is a Number Divisible by 2, 3, 4, 5, 6, 8, 9, or 10?	11
1-2	Decimal Place Values	30
2-1	Comparing Decimals, Fractions, and Percents	47
2-2	Comparing Solution Strengths	52
3-1	Basic Units of Metric Measurement	77
3-2	Common Metric System Prefixes	78
3-3	Combining Prefixes and Units	78
3-4	Equivalent Metric Measurements	82
3-5	Abbreviations for Household Measures	86
3-6	Apothecary and Household Equivalent Measures	87
3-7	Approximate Equivalent Measures for Volume	89
3-8	Approximate Equivalent Measures for Weight	90
4-1	Needle Gauge and Length	118
5-1	The Seven Rights of Medication Administration	134
5-2	Converting Roman Numerals	137
5-3	Abbreviations Commonly Used in Drug Orders	138
5-4	Do-Not-Use Abbreviations	140
5-5	Undesirable Abbreviations	141
5-6	Sample Times for Medication Administration	149
6-1	Sections of a Package Insert	174
7-1	The Language of Dosage Calculations	196
8-1	Examples of Food and Drug Interactions	253
9-1	Sample Solution Strengths	286
10-1	Commonly Used Abbreviations	341
10-2	Verifying Compatibility	343
11-1	Conditions that May Impact Dosing	381
11-2	Age-Related Factors that May Impact Dosing	382
11-3	What Patients Should Know About Medications	382
11-4	Pediatric Injections	391
11-5	Drugs to Be Avoided in Specific Diseases	412
12-1	Timing of Insulin Action	421

PATIENT EDUCATION

Chapter #	Name	Page #
4	Using medicine cups, droppers, and calibrated spoons	107
5	Basic information regarding drugs	135
6	Taking medications at home	181
8	Guidelines for taking tablets and capsules	255
8	Steps for reconstituting liquid medications	269
10	Caring for in-home heparin or saline locks	371
11	Educating parents and caretakers	383
12	Measuring a single insulin dose	425

CRITICAL THINKING ON THE JOB

Chapter #	Name	Page #
1	Rounding Errors with 9	34
1	Placing Decimals Correctly	42
2	Confusing Percent Strength with Percent Conversions	53
2	Reversing Terms in the Ratio Strength	61
2	Confusing Multiplying Fractions with Cross-Multiplying	72
2	Setting Up the Correct Proportion	73
3	Placing the Decimal Point Correctly	83
3	Selecting the Correct Conversion Factor	96
4	Use the Correct Dropper	110
4	Finishing What You Start	119
4	Document the Use of Patches	124
5	Understanding the Order of Roman Numerals	137
5	The Importance of the Right Dose	144
5	The Importance of the Right Drug	145
5	Using Critical Thinking; Lasix Order	154
6	Read Labels Carefully	175
6	Avoid Unnecessary Risks	186
7	Using Critical Thinking; Checking Your Answer Before Administering a Medication	216
7	Using Critical Thinking; Aminocaproic Acid Order	226
8	Calculating Factors Incorrectly	252
8	Reconstituting Powders	269
9	Confirming the Physician's Order	295
9	Confusing the Amount of Solution with the Dosage Unit	306
9	Recording Accurate Information	321
10	Checking Compatibility	344
10	Adjusting the Flow Rate	357
11	Looking for Warnings	396
11	Consulting the Physician	410
12	Clarifying the Order	422

ERROR ALERTS!

Chapter #	Name	Page #
1	Reducing a fraction does not automatically mean you have simplified it to its lowest terms.	11
1	Avoid canceling too many terms.	26
1	Write division problems carefully to avoid mistakes.	29
2	Do not forget the units of measurement.	61
3	Remember: The larger the unit, the smaller the quantity. The smaller the unit, the larger the quantity.	83
3	Do not confuse grains and grams.	84
3	Do not confuse the symbols for drams and ounces.	85
4	The utensil you use must provide the calibration you need to accurately measure the dose.	109
4	Pay close attention to the calibration of any syringe you use.	117
5	Never guess what the prescriber meant.	144
5	Always be certain that you are dispensing the correct medication.	145
6	Give the right medication by the right route.	170
6	Consider the age and health needs of your patient when you administer a drug.	173
7	Always cancel units with fraction proportion correctly.	200
7	Always cancel units with ratio proportion correctly.	202
7	Canceling units for dimensional analysis	205
9	Select the correct instructions for the strength and route ordered.	320
11	Converting ounces carefully	395
11	Calculating doses for medications strongly bound to lean body tissue	410
12	When two types of insulin are combined, measure the correct amount of each.	428

Resources and Ancillaries to Make Your Job Easier

Given the importance of performing accurate math and dosage calculations and the potential lack of time available to teach the subject, the *Math and Dosage Calculations for Medical Careers* program includes multiple resources and ancillaries for your convenience.

1. Comprehensive student CD-ROM that directly and completely corresponds with the student textbook. The textbook and CD-ROM can be used for classroom study or independent self-study. Students can review with multiple drill and practice question sections that include graphics and animation to attract attention, increase interest, and improve comprehension. After completing a chapter in the book and the exercises on the CD-ROM, students can print their scores to document their proficiency. This comprehensive CD-ROM along with the student text could be used as part of a distance education course for independent student study, or as a hybrid course for dosage calculations.
2. *Instructor's Manual* with additional activities and tests for each chapter that include the solutions. Plus detailed solutions to all questions are provided in the student self-study text. Alternative chapter evaluation tests and pretest and posttest are included with the Effective Instruction CD-ROM.

3. Effective Instruction CD-ROM includes Easy Test generator PowerPoint presentations for each chapter, plus a figure browser. Easy Test allows instructors to create their own tests from the database of test questions. The PowerPoint presentations can be used for classroom instruction or for independent study. These presentations include “Apply Your Knowledge” questions to promote discussion and interactivity. The figure browser provides over 50 labels and other graphics to use for your own tests, worksheets, or presentations.
4. Online Learning Center provides fluid and valuable resources for you as well as correlated student and password-protected instructor resources. These include case studies; math concept review section; Power Points; Career Opportunities; and games such as Concentration, crossword puzzles, flashcards; and drug company links.