

OGDEN • FLUHARTY

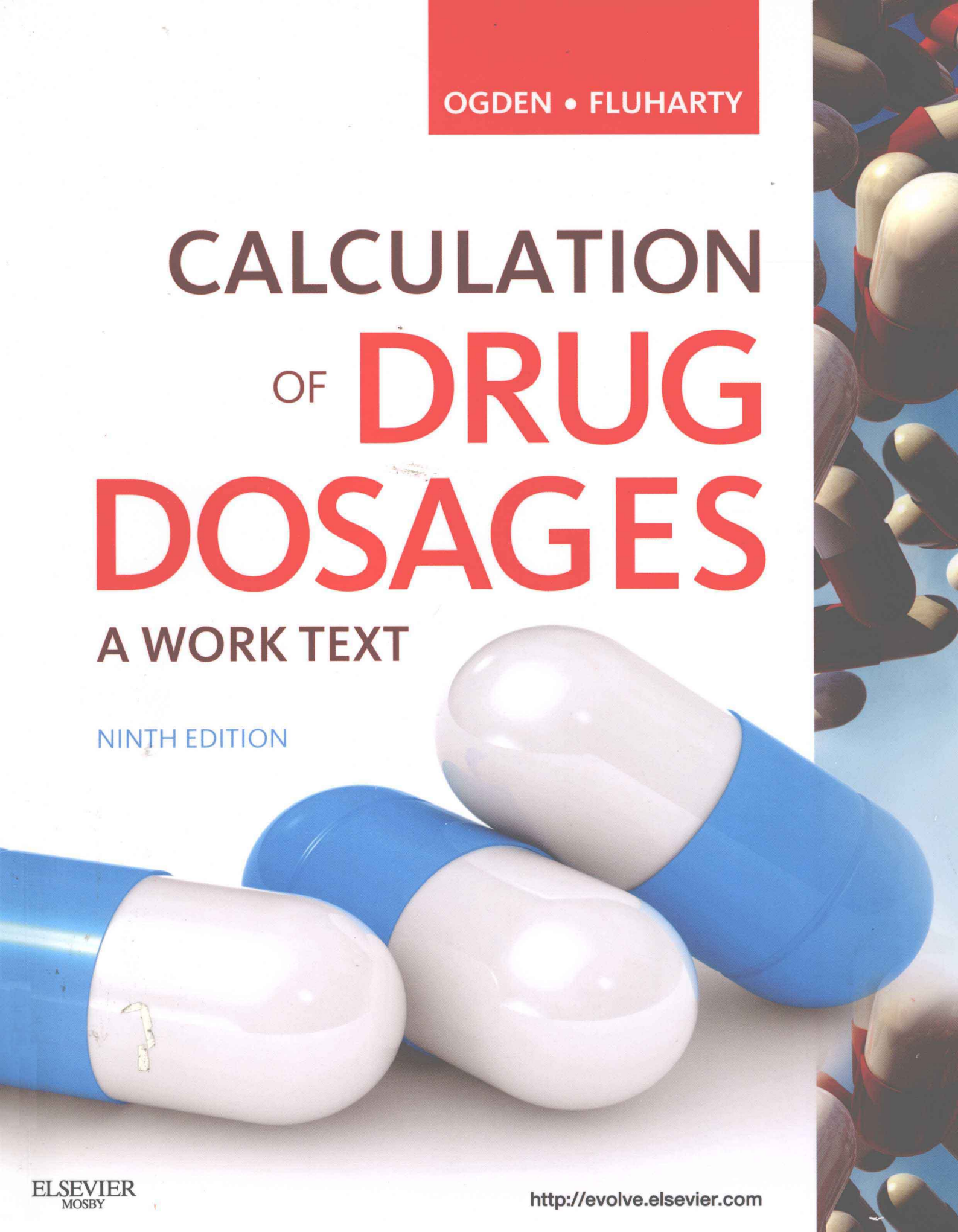
CALCULATION OF **DRUG** **DOSAGES**

A WORK TEXT

NINTH EDITION

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CALCULATION OF DRUG DOSAGES

A WORK TEXT

NINTH EDITION



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*To David, my husband and best friend, for your patience, support, and love;
and to our ever-expanding family, John, Shannon, Kate, Amy, Ryan,
Connor, Justin, and Maya.*

S.J.O.

*To my parents, Richard and Arlene Duke,
for their love and support when I said I wanted to be a nurse.
Love, Linda.*

L.K.F.



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Acknowledgments

We are grateful to the students and instructors who have chosen to use this book; we continue to learn so much from each of you. You have helped us understand the problems that students have with basic mathematics and with the calculation of drug dosages. We appreciate the physicians, nurses, pharmacists, and representatives of various health care agencies who took the time to discuss topics with us. We hope this book will provide readers with a feeling of confidence when working with a variety of mathematical problems.

We are excited and appreciative to have Mary Ann Reklau and Christine Simon lend their skills and expertise for the students' education of calculating correct and safe dosages in the area of pediatrics and obstetrics.

We want to give special thanks to the reviewers of this text. Your sincere evaluation and critique played an integral part in the revision of this edition, and your attention to detail was most helpful.

We would also like to acknowledge Danielle Frazier and Yvonne Alexopoulos for their help and support during the writing of this ninth edition. Danielle supplied answers to many questions, pushed to meet deadlines, and offered her services as needed. She also remained calm and offered guidance during the entire revision process. Yvonne has been diligent in providing clarity on the needs of students, faculty, and hospitals as the scope and use of the book continue to grow.

Thank you all so much!

Sheila J. Ogden
Linda K. Fluharty



Preface to Instructors

This work text is designed for students in professional and vocational schools of nursing and for nurses returning to practice after being away from the clinical setting. It can be used in the classroom or for individual study. The work text contains an extensive review of basic mathematics to assist students who have not mastered the subject in previous educational experiences. It can also be used by those who have not attended school for a number of years and feel a lack of confidence in the area of mathematics computations.

ORGANIZATION OF MATERIAL

A pretest precedes each chapter in Parts One and Two and may be used for evaluating present skills. For those students who are comfortable with basic mathematics, a quick assessment for each area will confirm their competency in the subject matter.

Part Two begins with the use of the metric system, which is predominant in the medical field; the apothecary system continues to decline in use. However, in remembering that differences in practice exist throughout the United States and the world, it was felt that the content concerning the apothecary system should remain in the text. Still, the number of problems and amount of emphasis have remained reduced in this edition. These chapters remain separate because each system must be learned separately before it can be manipulated in conversions.

Part Three helps students prepare for the actual calculation of drug dosages. Chapter 9 discusses various points concerning patient safety as it relates to medication administration. This chapter also includes safety issues for the nurse in the dispensing of medications. The case scenarios really emphasize the importance of delivering the correct medication to the patient as ordered. Chapter 10 provides an emphasis on the interpretation of the physician's orders, and Chapter 11 explains how to read drug labels. This section ends with Chapter 12, in which dimensional analysis as a method to calculate drug dosages is introduced.

In Part Four, Chapters 13 to 15 introduce the proportion and alternative formula methods for the calculation of drug dosage problems. The actual drug labels have been updated and increased in number in all of the chapters dealing with the calculation of drug dosages. Also, content related to dosages measured in units has been expanded. Because of the continued increased use of IV fluids in health care, Chapter 16, Intravenous Flow Rates, has again been expanded, as has Chapter 17, Critical Care Intravenous Flow Rates. Chapter 18, Pediatric Dosages, has been expanded and now includes pediatric IV flow rate problems as well. Chapter 19, Obstetric Dosages, has been added to address calculation in regards to obstetrical patients.

Part Five includes content concerning automated medication-dispensing systems found in Chapter 20. Chapter 21 on special considerations for the elderly has been enhanced, as has Chapter 22, which discusses home care considerations. The student needs to remember that the actual calculation of drug dosages does vary based on the setting of the patient. Also, the administration and delivery may be affected by the age and location of the patient in the health care system.

The majority of the calculation problems relating to drug dosages continue to represent actual physicians' orders in various health care settings.

FEATURES IN THE NINTH EDITION

- Learning objectives are listed in the beginning of each chapter so that students will know the goals that must be achieved.
- Chapter work sheets provide the opportunity to practice solving realistic problems.
- Almost every chapter contains two posttests designed to evaluate the student's learning.
- A comprehensive posttest at the end of the book will help students assess their total understanding of the process of calculation of drug dosages.
- A glossary is included to define important terms.
- Numerous full-color drug labels continue to provide a more realistic representation of medication administration.
- NEW! Chapter 19, Obstetric Dosages, has been added to address calculation in regards to obstetrical patients.

ANCILLARIES

Evolve resources for instructors and students can be found online at <http://evolve.elsevier.com/Ogden/calculation/>.

The Instructor Resources are designed to help instructors present the material in this text and include the following:

- New! Drug Label Glossary
- TEACH Lesson Plans
- TEACH Lecture Outlines
- TEACH PowerPoint Slides
- Test Bank
- Suggested Class Schedules
- Chapter Teaching Strategies and Tips
- NEW VERSION! *Romans & Daugherty Dosages and Solutions CTB, version 3*. This generic test bank contains over 700 questions on general mathematics, converting within the same system of measurements, converting between different systems of measurement, oral dosages, parenteral dosages, flow rates, pediatric dosages, IV calculations, and more.

Student Resources provide students with additional tools for learning and include the following:

- Student Practice Problems and Learning Activities
- Dimensional Analysis Answer Key
- Flash Cards
- NEW VERSION! *Drug Calculations Companion, version 4*. This is a completely updated, interactive student tutorial that includes an extensive menu of various topic areas within drug calculations, such as oral, parenteral, pediatric, and intravenous calculations. It contains over 600 practice problems covering ratio and proportion, formula, and dimensional analysis methods.



Preface to Students

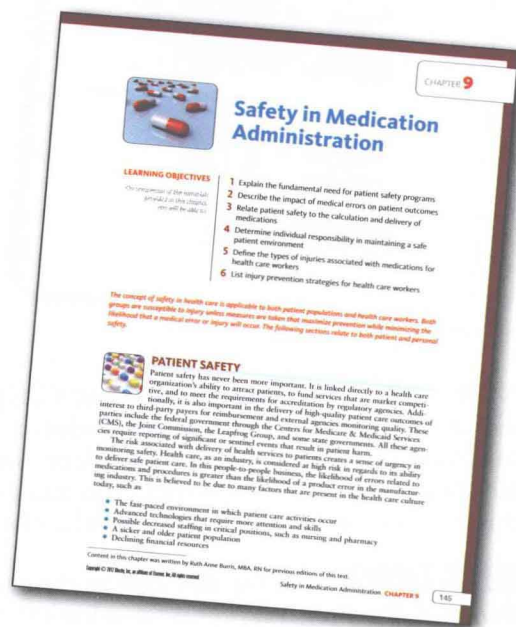
DESCRIPTION AND FEATURES

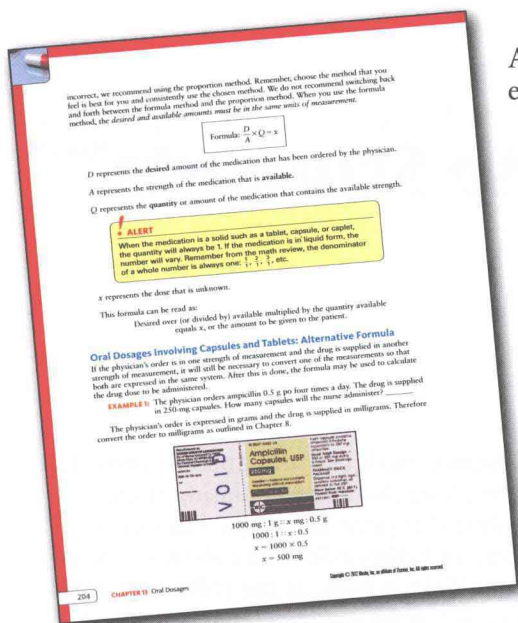
Calculation of Drug Dosages is an innovative drug calculation work text designed to provide you with a systematic review of mathematics and a simplified method of calculating drug dosages. It affords you the opportunity to move at a comfortable pace to ensure success. It includes information on the ratio and proportion, formula, and dimensional analysis methods of drug calculation, as well as numerous practice problems. Take a look at the following features so that you may familiarize yourself with this text and maximize its value.



Pretests evaluate your present skills in utilizing mathematics, units, and measurements.

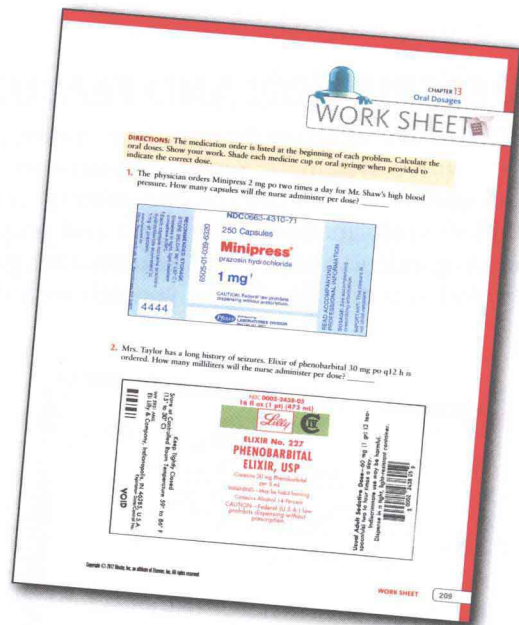
Learning Objectives highlight key content and goals that must be achieved.





Alerts highlight potential and common drug calculation errors.

Work Sheets provide you with the opportunity to practice solving realistic problems.



Posttests are designed to assess your learning and identify your strengths and weaknesses.

NEW VERSION! Drug Calculations Companion, Version 4. This is a completely updated, interactive student tutorial that includes an extensive menu of various topic areas within drug calculations, such as oral, parenteral, pediatric, and intravenous calculations. It contains over 600 practice problems covering ratio and proportion, formula, and dimensional analysis methods. It is available on Evolve at <http://evolve.elsevier.com/Ogden/calculation/>.

evolve Look for this icon at the end of the chapters. It will refer you to *Drug Calculations Companion, Version 4* for additional practice problems and content information.



Using This Work Text

A pretest precedes each chapter in Parts One and Two to assess previous learning. If your grade on the pretest is acceptable (an acceptable score is noted at the top of the test), you may continue to the next pretest. If your score on the pretest indicates a need for further study, read the introduction to the chapter, study the method of solving the problems, and complete the work sheet. If you have difficulty with a problem, refer to the examples in the introduction.

On completion of the work sheet, refer to the answer key in the back of the book to verify that your answers are correct. Rework all the incorrect problems to find your errors. It may be necessary to refer again to the examples in each chapter. Then proceed to the first posttest and grade the test. If your grade is acceptable, as indicated at the top of the test, continue to the next chapter. If your grade is less than acceptable, rework all incorrect problems to find your errors. Review as necessary before completing the second posttest. Again verify that your answers are correct. At this point, if you have followed the system of study, your grade on the second posttest should be more than acceptable. Follow the same system of study in each of the chapters.

When all the chapters in the work text are completed with acceptable scores (between 95% and 100%), you should be proficient in solving problems relating to drug dosages; more importantly, you will have completed the first step toward becoming a safe practitioner of medication administration.

On completion of the material provided in this work text, you will have mastered the following mathematical concepts, to be used for the accurate performance of computations:

1. Solving problems using fractions, decimals, percents, ratios, and proportions
2. Solving problems involving the apothecary, metric, and household systems of measurements
3. Solving problems measured in units and milliequivalents
4. Solving problems related to oral and parenteral dosages
5. Solving problems involving intravenous flow rates and critical care intravenous flow rates
6. Solving problems confirming the correct dosage of pediatric medications
7. Solving problems confirming the correct dosages of OB medications
8. Solving problems by using the proportion, formula, or dimensional analysis methods

You are now ready to begin Chapter 1!



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REVIEW of MATHEMATICS



REVIEW OF MATHEMATICS PRETEST

CHAPTER 1 Fractions

CHAPTER 2 Decimals

CHAPTER 3 Percents

CHAPTER 4 Ratios

CHAPTER 5 Proportions



REVIEW OF MATHEMATICS POSTTEST


A solid knowledge base of general mathematics is necessary before you will be able to use these concepts in the more complicated calculations of drug dosages. It is this knowledge that allows for the safe administration of medications to your patients and prevents medication errors.

For students who have been away from basic mathematics awhile, please take the time and effort to review the multiplication tables of one through twelve. These tables must be memorized to allow ease in the computation of all problems found in this textbook.

As you prepare to learn how to calculate drug dosages, an assessment of your current basic mathematics understanding and competency is essential. A general mathematics pretest is provided. Allow 1 to 2 hours in a quiet study area to complete the pretest without the use of a calculator. This is your opportunity to assess your true capability of performing basic math problems. Calculators are very useful tools. In most areas of health care, the use of a calculator is actually required to ensure accuracy in the delivery of medications. Follow the direction of your instructor as to the acceptable use of calculators while using this text on your path to safe administration of medications.

The pretest allows you to assess your need for a more extensive review. After completion of the test, check your answers with the key provided. A score of 95%, or 48 out of 50 problems correct, indicates a firm foundation in basic mathematics. You may then skip to Part II, Units and





Measurements for the Calculation of Drug Dosages. However, a score of 47 or below indicates a need to review fraction, decimal, percent, ratio, and/or proportion calculations. Chapters 1 through 5 allow you to work on these basic mathematical skills at your leisure.

The pretest and review chapters are provided to ensure your success in the calculation and administration of your future patients' medications. Begin now, and good luck!

NAME _____

DATE _____

ACCEPTABLE SCORE **48**

YOUR SCORE _____



Review of Mathematics

PRETEST



DIRECTIONS: Perform the indicated computations. Reduce fractions to lowest terms.

1. $\frac{3}{8} + \frac{1}{3} =$ _____

2. $2\frac{3}{7} + 1\frac{2}{3} =$ _____

3. $1\frac{3}{5} + \frac{7}{8} \div \frac{1}{3} =$ _____

4. $1.03 + 2.2 + 1.134 =$ _____

5. $1.479 + 28.68 + 4.5 =$ _____

6. $1\frac{4}{15} - \frac{1}{6} =$ _____

7. $2\frac{1}{3} - \frac{1}{2} =$ _____

8. $2.04 - 0.987 =$ _____

9. $8.53 - 7.945 =$ _____

10. $3 \times \frac{4}{7} =$ _____