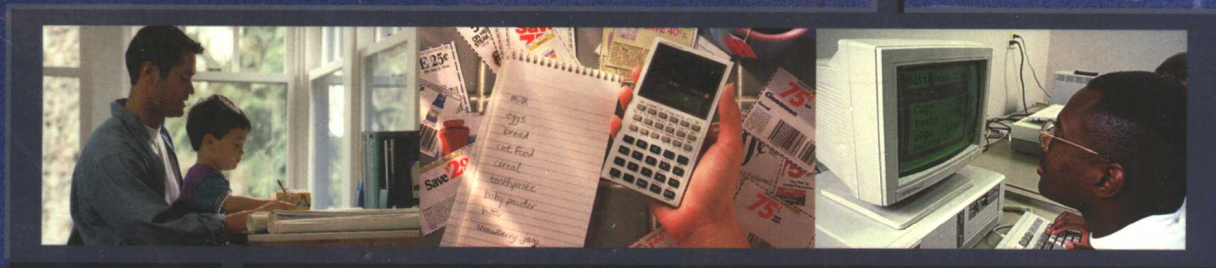


BASIC

Mathematical Skills

Fourth Edition

WITH GEOMETRY



**Streeter
Hutchison
Hoelzle**

BASIC
Mathematical
Skills WITH GEOMETRY
Fourth Edition

James Streeter

Late Professor of Mathematics
Clackamas Community College

Donald Hutchison

Clackamas Community College

Louis Hoelzle

Bucks County Community College

 **WCB**
McGraw-Hill

Boston, Massachusetts Burr Ridge, Illinois Dubuque, Iowa
Madison, Wisconsin New York, New York San Francisco, California St. Louis, Missouri

WCB/McGraw-Hill

A Division of The McGraw-Hill Companies

Basic Mathematical Skills with Geometry

Instructor's Edition for Basic Mathematical Skills with Geometry

Copyright © 1998, 1993, 1989, 1986 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a data base or retrieval system, without the prior written permission of the publisher.

This book is printed on acid-free paper.

3 4 5 6 7 8 9 0 VNH VNH 9 0 0

ISBN 0-07-063266-9 (Student Edition)

ISBN 0-07-063270-7 (Instructor's Edition)

Publisher: Tom Casson
Sponsoring editor: Jack Shira
Marketing manager: Michelle Sala
Project manager: Eva Marie Strock
Production supervisor: Tanya Nigh
Designer: Wanda Kofax
Cover designer: Linear Design Group
Compositor: York Graphic Services, Inc.
Typeface: Times New Roman
Printer: Von Hoffmann Press, Inc.

Library of Congress Cataloging-in-Publication Data

Streeter, James (James A.)

Basic mathematical skills with geometry / James Streeter, Donald Hutchison, Louis Hoelzle.—4th ed.

p. cm.

Includes index.

ISBN 0-07-063266-9 (student's ed. acid-free paper), —ISBN 0-07-063270-7 (instructor's ed. acid-free paper)

1. Arithmetic. 2. Algebra. 3. Geometry. I. Hutchison, Donald, 1948- . II. Hoelzle, Louis F. III. Title.

QA107.A783 1998

513'.14—dc21

97-36774
CIP

<http://www.mhhe.com>

This book is dedicated to the family I grew up with: my parents, Jack and Melinda, and my brothers, Tom, Paul, Lee, and Dean. They formed the foundation of my being.

Don Hutchison

This book is dedicated to my parents, whose love and complete support were always there for me. They molded my character and ideas.

Louis Hoelzle

THIS SERIES IS DEDICATED TO THE
MEMORY OF JAMES ARTHUR
STREETER, AN ARTISAN WITH
WORDS, A GENIUS WITH NUMBERS,
AND A VIRTUOSO WITH PICTURES
FROM 1940 UNTIL 1989.

ABOUT THE AUTHORS

While a graduate student at the University of Washington, **James Streeter** paid for his education as a math tutor. It was here that he began to formulate the ideas that would eventually become this package. Upon graduation, he taught for 2 years at Centralia Community College. In 1968 he moved on to Clackamas Community College to become the school's first mathematics chair.

At the college, Jim recognized that he faced a very different population than the one he had tutored at the University of Washington. Jim was convinced that to reach the maximum number of these students, he would have to utilize every medium available to him. Jim opened a math lab that included CAI, original slides and tapes (which were eventually published by Harper & Row), and original worksheets and text materials. With the assistance of the people at McGraw-Hill, that package has been refined to include media and supplements that did not even exist when this project began.

Donald Hutchison spent his first 10 years of teaching working with disadvantaged students. He taught in an intercity elementary school and an intercity high school. He also worked for 2 years at Wassaic State School in New York and 2 years at the Portland Habilitation Center. He worked with both physically and mentally disadvantaged students in these two settings.

In 1982, Don was hired by Jim Streeter to teach at Clackamas Community College. In 1989, Don became Chair of the Mathematics Department at the college. It was here at Clackamas that Don discovered two things that, along with his family, form the focus for his life. Jim introduced Don to the joy of writing (with the first edition of *Beginning Algebra*), and Jack Scrivener converted him to a born-again environmentalist.

Don is also active in several professional organizations. He was a member of the ACM committee that undertook the writing of computer curriculum for the 2-year college. From 1989 to 1994 he was the Chair of the Technology in Mathematics Education Committee for AMATYC. He was President of ORMATYC from 1996 to 1998.

Louis Hoelzle has been teaching at Bucks County Community College for 27 years. In 1989, Lou became Chair of the Mathematics Department at Bucks County Community College. He has taught the entire range of courses from Arithmetic to Calculus, giving him an excellent view of the current and future needs of developmental students.

Over the past 34 years, Lou has also taught Physics courses at 4-year colleges, which has enabled him to have the perspective of the practical applications of mathematics. In addition, Lou has extensively reviewed manuscripts and written several solutions manuals for major textbooks. In these materials he has focused on writing for the student.

Lou is also active in professional organizations. He has served on the Placement and Assessment Committee for AMATYC since 1989.

PREFACE

Statement of Philosophy

We believe that the key to learning mathematics, at any level, is active participation. When students are active participants in the learning process, they have the opportunity to construct their own mathematical ideas and make connections to previously studied material. Such participation leads to understanding, success, and confidence. We developed this text with this philosophy in mind. The *Check Yourself* exercises are designed to keep students involved and active with every page of exposition. The calculator references involve students actively in the development of mathematical ideas. The chapter-opening vignettes attract the interest of the students by describing a worker in an occupation to which mathematics is relevant. Many exercise sets have application problems, challenging exercises, writing exercises, and collaborative exercises. Each exercise is designed to awaken interest and insight within students. Not all the exercises will be appropriate for every student, but each one provides another opportunity for both instructor and student. Our hope is that every student who uses this text will be a better mathematical thinker as a result.

Changes from the Third Edition

As we set out to revise *Basic Mathematical Skills with Geometry*, we had to keep in mind that this is a successful text with a very supportive group of adopters. Our goal in this revision was to incorporate new elements to enhance an already proven system. In order to accomplish this goal, we regularly communicated with both current and potential users of the text. We also solicited contributions from professionals with considerable experience in the implementation of collaborative and writing activities in the classroom. We worked hard to incorporate these ideas throughout the text. Every potential change was sent to a set of reviewers. We were very pleased with the support we received from these reviewers. We believe collaborating with so many adept professionals (see the Acknowledgments section) has greatly enhanced this text.

Integration of Applications

Beginning with Chapter 1, in which we introduce the definition of perimeter, every chapter (and virtually every section) has a set of application problems relevant to the material being presented.

Writing in Mathematics

Almost every section includes a set of writing exercises. These exercises encourage students to both research and communicate mathematical ideas. We tried to build a model that helps students understand that being able to solve a problem is useful only if you first understand the problem and then are able to communicate your solution.

Collaborative Projects

A number of collaborative projects are included in this book, for two main reasons. First, they allow students to build group cooperation skills while facing challenging exercises. Second, our students have had fun doing them. We strongly encourage you to assign these projects.

Calculator Sections

In the previous three editions we included a few special sections on calculator usage. In this fourth edition we doubled the number of these sections. The topics include operations on whole numbers, operations on fractions, and exponents, and the sections discuss the use of several types of calculators, including the TI-82 and the TI-83, in carrying out these operations.



Pretest for Chapter 4

ANSWERS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Factors and Multiples

This pretest will point out any difficulties you may be having with the factors and multiples of whole numbers. Do all the problems. Then check your answers with those in the back of the book.

1. List all the factors of 42.
2. For the group of numbers 2, 3, 6, 7, 9, 17, 18, 21, and 23, list the prime and composite numbers.

Using divisibility tests, determine which, if any, of the numbers 2, 3, and 5 are factors of each of the following numbers.

- | | |
|--------|---------|
| 3. 546 | 4. 5130 |
|--------|---------|

Write the prime factorizations for each of the following numbers.

- | | |
|-------|--------|
| 5. 60 | 6. 350 |
|-------|--------|

Find the greatest common factor (GCF) for each of the following groups of numbers.

- | | |
|--------------|-------------------|
| 7. 12 and 32 | 8. 24, 36, and 42 |
|--------------|-------------------|

Find the least common multiple (LCM) for each of the following groups of numbers.


- | | |
|--------------|--------------------|
| 9. 25 and 30 | 10. 12, 16, and 18 |
|--------------|--------------------|

Pedagogical Features

This edition has taken seven major directions. The changes are presented below, with examples of each one. Each feature is designed to encourage, facilitate, and motivate problem solving among students. This goal is not just the nature of these books, it is the primary argument for the inclusion of mathematics in virtually every curriculum.

Pretests and Self-Tests

Each chapter begins with a pretest and ends with a self-test. These tests allow each student to perform a self-assessment. Each pretest provides a baseline from which students can measure success when the self-test is taken at the end of the chapter. The self-test also helps prepare students for classroom testing.



Self-Test for Chapter 4

Name	Date
Section	

The purpose of the Self-Test is to help you check your progress and review for a chapter test in class. Allow yourself about 1 hour to take the test. When you are done, check your answers in the back of the book. If you missed any answers, be sure to go back and review the appropriate sections in the chapter and do the supplementary exercises provided there.

[4.1]

1. List all of the factors of 18.
2. List all of the factors of 42.
3. List all of the factors of 17.
4. From the group of numbers 13, 21, 29, 37, 51, 1, and 91, list the prime numbers.
5. List the composite numbers from the group of numbers in Exercise 4.
6. List the prime numbers between 40 and 60.

[4.1]

In Exercises 7 to 10, use the divisibility tests to determine which, if any, of the numbers 2, 3, and 5 are factors of the given numbers.	8. 341
	10. 3585
	9. 774

[4.2]

In Exercises 11 to 14, find the prime factorization.	12. 72
	14. 792
	11. 42
	13. 210

[4.3]

In Exercises 15 to 22, find the greatest common factor (GCF) for each of the given numbers.	16. 30 and 48
	15. 10 and 15

ANSWERS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

241



4.1 Prime and Composite Numbers

In Section 2.1 we said that since $2 \times 5 = 10$, we call 2 and 5 **factors** of 10.

4.1 OBJECTIVES

1. Find the factors of a number.
2. Determine whether a number is prime, composite, or neither.
3. Determine whether a number is divisible by 2, 3, or 5.



2 and 5 can also be called **divisors** of 10. They divide 10 exactly.

This is a complete list of the factors. There are no other whole numbers that divide 18 exactly. Note that the factors of 18, except for 18 itself, are smaller than 18.

Definition of a Factor

A **factor** of a whole number is another whole number that will *divide exactly* into that number. This means that the division will have a remainder of 0.

• Example 1

Finding Factors

List all factors of 18.

$$3 \times 6 = 18$$

Since $3 \times 6 = 18$, 3 and 6 are factors (or divisors) of 18.

$$2 \times 9 = 18$$

2 and 9 are also factors of 18.

$$1 \times 18 = 18$$

1 and 18 are factors of 18.

1, 2, 3, 6, 9, and 18 are all the factors of 18.

••• CHECK YOURSELF 1

List all the factors of 24.

Check Yourself Exercises

These exercises have been the hallmark of the text; they are designed to actively involve students throughout the learning process. Each example is followed by an exercise that encourages students to solve a problem similar to the one just presented. Answers are provided at the end of the section for immediate feedback.

• Example 4

Determining If a Number Is Divisible by Two

Which of the following are divisible by 2?

- 2346 is divisible by 2.
 13,254 is divisible by 2.
 23,573 is *not* divisible by 2.
 57,085 is *not* divisible by 2.

••• CHECK YOURSELF 4

Which of the following are divisible by 2?

- 274 3587 7548 13,593

••• CHECK YOURSELF 5

- a. Is 372 divisible by 2? By 3? b. Is 5493 divisible by 2? By 3?

Let's look now at a third divisibility test.

Divisibility by 5

A whole number is divisible by 5 if its last digit is 0 or 5.

• Example 6

Determining If a Number Is Divisible by Five

- 2435 is divisible by 5.
 23,123 is *not* divisible by 5.
 123,240 is divisible by 5.

Its last digit is 5.

Its last digit is 3.

Its last digit is 0. Do you see that 123,240 is also divisible by 2 and 3?

••• CHECK YOURSELF 6

- a. Is 12,585 divisible by 5? By 2? By 3?
 b. Is 5890 divisible by 5? By 2? By 3?

••• CHECK YOURSELF ANSWERS

1. 1, 2, 3, 4, 6, 8, 12, and 24. 2. 2, 11, 19, 23, and 41 are prime numbers.
 3. 6, 10, 16, 22, 27, and 35 are composite numbers. 4. 274 and 7548.
 5. (a) Yes in both cases; (b) only by 3. 6. (a) By 5 and by 3;
 (b) by 5 and by 2.

Comprehensive Exercise Sets

Complete exercise sets are at the end of each section as well as after the summary at the end of each chapter. These exercises were designed to reinforce basic skills and develop critical thinking and communication abilities. Exercise sets include writing and word problems as well as collaborative and group exercises.

4.1 Exercises

Name _____ Date _____
Section _____

List the factors of each of the following numbers.

1. 4	2. 6
3. 10	4. 12
5. 15	6. 21
7. 24	8. 32
9. 64	10. 66
11. 11	12. 37

Use the following list of numbers for Exercises 13 and 14.
15, 19, 23, 31, 49, 55, 59, 87, 91, 97, 103, 105

13. Which of the given numbers are prime?
14. Which of the given numbers are composite?
15. List all the prime numbers between 30 and 50.
16. List all the prime numbers between 55 and 75.

ANSWERS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

209

21. _____

22. _____

23. _____

19. Which of the given numbers are divisible by 5?

20. Which of the given numbers are divisible by 10?

21. Why is the following not a valid divisibility test for 8?
"A number is divisible by 8 if it is divisible by 2 and 4"
Support your answer with an example. Determine a valid divisibility test for 8.

22. Prime numbers that differ by two are called "twin primes." Examples are 3 and 5, 5 and 7, and so on. Find one pair of twin primes between 85 and 105.

23. The Greek mathematician Eratosthenes developed a method to identify prime numbers in a list of numbers. The method is called the "Sieve of Eratosthenes." Research this topic and describe it to your classmates. Then use it to find all the prime numbers less than 100.

Getting Ready for Section 4.2
[Section 3.3]

Divide, using short division.

a. $3\overline{)72}$	b. $5\overline{)90}$	c. $4\overline{)84}$
d. $2\overline{)384}$	e. $3\overline{)693}$	f. $5\overline{)750}$

ANSWERS

- _____
- _____
- _____
- _____
- _____
- _____

Answers

1. 1, 2, and 4	3. 1, 2, 5, and 10	5. 1, 3, 5, and 15
7. 1, 2, 3, 4, 6, 8, 12, and 24	9. 1, 2, 4, 8, 16, 32, and 64	11. 1 and 11
13. 19, 23, 31, 59, 97, 103	15. 31, 37, 41, 43, 47	
17. 72, 158, 260, 378, 570, 585, 4530, 8300	19. 45, 260, 570, 585, 4530, 8300	
21. _____	23. _____	a. 24 b. 18 c. 21 d. 192 e. 231

f. 150

Getting Ready for Section 4.3
[Section 4.1]

List all factors of the following numbers.

a. 12	b. 20
c. 30	d. 45
e. 17	f. 29

Answers

1. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$	3. $1 \cdot 2 \cdot 4 \cdot 5 \cdot 10 \cdot 20$	5. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 8 \cdot 12 \cdot 16 \cdot 24$
7. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 8 \cdot 12 \cdot 24$	9. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 9 \cdot 18$	11. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$
13. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$	15. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 10 \cdot 15 \cdot 20 \cdot 30 \cdot 60$	17. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$
19. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$	21. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$	23. $1 \cdot 2 \cdot 3 \cdot 4 \cdot 6 \cdot 12$

ANSWERS

- _____
- _____
- _____
- _____
- _____
- _____

Getting Ready Exercises

These exercises draw on problems from previous sections of the text and are designed to help students review concepts that will be applied in the following section. This preview helps students make important connections with upcoming material.

Supplementary Exercises

Each exercise set includes a second set of exercises for which answers are not provided in the text.

4.1 Supplementary Exercises

ANSWERS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
- List the factors of each of the following numbers.
1. 15 2. 16 3. 30
4. 40 5. 42 6. 53
7. 11 8. 33 9. 35
10. 37 11. 99 12. 73
- Label each of the following numbers as prime or composite.
13. List all the prime numbers between 45 and 65.
- Use the following list of numbers for Exercises 14 through 16.
65, 78, 952, 1259, 5490, 14,685, 22,390
14. Which of the given numbers are divisible by 2?
15. Which of the given numbers are divisible by 3?
16. Which of the given numbers are divisible by 5?

Summary Exercises

ANSWERS

- You should now be reviewing the material in Chapters 1-4. The following exercises will help in that process. Work all the exercises carefully. Then check your answers against the ones in the back of the book. References are provided there to the chapter and section for each exercise. If you made an error, go back and review the related material and do the supplementary exercises for that section.
- [1.1] In Exercises 1 and 2, give the place value of each of the indicated digits.
1. 6 in the numeral 5674 2. 5 in the numeral 543,400
- In Exercises 3 and 4, give word names for each of the following numerals.
3. 27,428 4. 200,305
- Write each of the following as a numeral.
5. Thirty-seven thousand, five hundred eighty-three
6. Three hundred thousand, four hundred
- In Exercises 7 and 8, name the property of addition that is illustrated.
[1.2] 7. $4 + 9 = 9 + 4$ 8. $(4 + 5) + 9 = 4 + (5 + 9)$
- In Exercises 9 to 11, perform the indicated operations.
[1.4] 9. $\begin{array}{r} 784 \\ 385 \\ +247 \\ \hline \end{array}$ 10. $\begin{array}{r} 2,570 \\ 498 \\ 21,456 \\ +28 \\ \hline \end{array}$
11. Give the total of 578, 85, 1235, and 12,824.
- Solve the following application.
12. **Passenger count.** An airline had 173, 212, 185, 197, and 202 passengers on five morning flights between Washington, D.C., and New York. What was the total number of passengers?

Summary for Chapters 1-4

Our Decimal Place-Value System

- 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are digits and 0-9 are numerals.
- 7,252,589
- Ones
Tens
Hundreds
Thousands
Ten Thousands
Hundred Thousands
Millions
- $2589 = (2 \times 1000) + (5 \times 100) + (8 \times 10) + (9 \times 1)$
- 5) Addends
-8) Sum
- $5 + 4 = 9$
 $(2 + 7) + 6 = 2 + (7 + 6)$
 $8 + 0 = 8 + 0$

The value of a numeral is the sum of each digit multiplied by its place value.

Addition
Addends The numbers that are being added.
Sum The result of the addition.

The Properties
The Commutative Property The order in which you add two whole numbers does not affect the sum.
The Associative Property The way in which you group whole numbers in addition does not affect the final sum.
The Additive Identity The sum of 0 and any whole number is just that whole number.

26. _____
27. _____
28. _____
29. _____
30. _____

[1.8] 22. Find the perimeter of the following figure.



[2.1] In Exercises 23 and 24, complete the statements by using the word "factor" or the word "multiple."

23. 6 is a _____ of 36. 24. 35 is a _____ of 5.

[2.1] In Exercises 25 and 26, name the property of addition and/or multiplication that is illustrated.

25. $7 \times 8 = 8 \times 7$ 26. $3 \times (4 + 7) = 3 \times 4 + 3 \times 7$

[2.3] In Exercises 27 to 30, perform the indicated operations.

27. $\begin{array}{r} 58 \\ \times 32 \\ \hline \end{array}$ 28. $\begin{array}{r} 25 \\ \times 43 \\ \hline \end{array}$ 29. $\begin{array}{r} 378 \\ \times 409 \\ \hline \end{array}$

30. Find the product of 59 and 723.

Cumulative Test for Chapters 1-4

This test is provided to help you in the process of reviewing Chapters 1 to 4. Answers are provided in the back of the book. If you missed any answers, be sure to go back and review the appropriate chapter sections.

1. Give the place value of 7 in 3,738,500.
2. Give the word name for 302,525.
3. Write two million, four hundred thirty thousand as a numeral.
In Exercises 4 to 6, name the property of addition that is illustrated.
4. $5 + 12 = 12 + 5$ 5. $9 + 0 = 9$
6. $(7 + 3) + 8 = 7 + (3 + 8)$
In Exercises 7 and 8, perform the indicated operations.
7. $\begin{array}{r} 593 \\ 275 \\ + 98 \\ \hline \end{array}$
8. Find the sum of 58, 673, 5325, and 17,295.
In Exercises 9 and 10, round the numbers to the indicated place value.
9. 5873 to the nearest hundred
10. 953,150 to the nearest ten thousand
In Exercise 11, estimate the sum by rounding to the nearest hundred.
11. $\begin{array}{r} 943 \\ 3281 \\ 775 \\ 2112 \\ + 579 \\ \hline \end{array}$

ANSWERS

12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
- In Exercises 12 and 13, complete the statements by using the symbol < or >.
12. 49 _____ 47 13. 80 _____ 90
- In Exercises 14 and 15, perform the indicated operations.
14. $\begin{array}{r} 4814 \\ - 973 \\ \hline \end{array}$
15. Find the difference of 25,000 and 7535.
- In Exercises 16 and 17, solve the applications.
16. **Attendance.** Attendance for five performances of a play was 172, 153, 205, 193, and 182. How many people attended those performances?
17. **Balance.** Alan bought a Volkswagen with a list price of \$8975. He added stereo equipment for \$439 and an air conditioner for \$615. If he made a down payment of \$2450, what balance remained on the car?
- In Exercises 18 to 20, name the property of addition and/or multiplication that is illustrated.
18. $3 \times (4 \times 7) = (3 \times 4) \times 7$

Summary and Summary Exercises

These comprehensive sections give students an opportunity to practice and review important concepts. Each summary is placed at the end of a group of chapters with a common theme. The summaries occur at the ends of Chapters 4 (whole numbers), 7 (fractions), 9 (decimals), 11 (ratios and proportions), and 14 (measurement and algebra). Answers are provided in the back of the text, with section references to aid in summarizing the material effectively.

Cumulative Tests

These tests help students build on what was previously covered and give them further opportunity for building skills necessary in preparing for midterm and final exams.

SUPPLEMENTS

Supplements

A comprehensive set of ancillary materials for both the student and the instructor is available with this text.

Instructor's Edition

This ancillary includes answers to all exercises and tests. These answers are printed in a second color for ease of use by the instructor and are located on the appropriate pages throughout the text.

Instructor's Solutions Manual

The manual provides worked-out solutions to the odd-numbered exercises in the text.

Instructor's Resource Manual

The resource manual contains multiple-choice placement tests for three levels of testing: (1) a diagnostic pretest for each chapter and three forms of multiple-choice and open-ended chapter tests; (2) two forms of multiple-choice and open-ended cumulative tests; and (3) two forms of multiple-choice and open-ended final tests. Also included is an answer section and appendixes that cover collaborative learning and the implementation of the new standards.

Print and Computerized Testing

The testing materials provide an array of formats that allow the instructor to create tests using both algorithmically generated test questions and those from a standard testbank. This testing system enables the instructor to choose questions either manually or randomly by section, question type, difficulty level, and other criteria. Testing is available for IBM, IBM-compatible, and Macintosh computers. A softcover print version of the testbank provides most questions found in the computerized version.

Streeter Video Series

The video series is completely new to this edition. It gives students additional reinforcement of the topics presented in the book. The videos were developed especially for the Streeter pedagogy, and features are tied directly to the main text's individual chapters and section objectives. The videos feature an effective combination of learning techniques, including personal instruction, state-of-the-art graphics, and real-world applications.

Multimedia Tutorial

This interactive CD-ROM is a self-paced tutorial specifically linked to the text and reinforces topics through unlimited opportunities to review concepts and practice problem solving. It requires virtually no computer training on the part of the students and supports IBM and Macintosh computers.

MathWorks

This DOS-based interactive tutorial software is available and specifically designed to accompany the Streeter pedagogy. The program supports IBM, IBM-compatible, and Macintosh computers as well as a variety of networks. MathWorks can also be used with its companion program, the Instructor's Management System, to track and record the progress of students in the class.

In addition, a number of other technology and Web-based ancillaries are under development; they will support the ever-changing technology needs in developmental mathematics. For further information about these or any supplements, please contact your local McGraw-Hill sales representative.

ACKNOWLEDGMENTS

Acknowledgments

In the process of writing four editions of this text, we learned much more than we could ever have taught. The faculty we work with, the students who do us the honor of signing up for our classes, and the staff at McGraw-Hill have all been part of our education. The first two groups are the most important, but the most difficult to identify. The totality of their contributions is overwhelming. Every student who has sat in our offices struggling to learn this material has helped us write the next edition. Every story that another teacher has told us, every AMATYC session we've attended, and every reviewer comment that we've read has become part of the fabric of this text. A great deal of thanks certainly goes to Zanae Rodrigo, the developmental editor for this book, as well as Norma James, who served as accuracy reviewer. In addition, our thanks goes to the following people for their important contributions to the development of this edition:

Gail Ann Aurand, Cloud County Community College (KA)
Linda Chamblin, Southern State Community College (OH)
Nancy Cholvin, Antelope Valley College (CA)
Katherine Creery, University of Memphis
Albert Deas, Trident Technical College (SC)
Philip Glynn, Naugatuk Valley Community College (CT)
Mary Henderson, Okaloosa-Walton Community College (FL)
Dawn Kindel, Newbury College (MA)
Tom Kremer, University of Wisconsin-Parkside
Nick Lahue, Penn Valley Community College (MO)
Kenneth McClain, University of Memphis
William Merrow, Western Michigan University
Renee Patterson, Cumberland County College (NJ)
Roy Pearson, St. Louis Community College at Florissant Valley
Marilyn Platt, Gaston College (NC)
Kathy Pletsch, Antelope Valley College (CA)
Deborah Puett, Isothermal Community College (NC)
Kathleen Sherman, Napa Valley College
Karen Spriegel, Muskingum Area Technical College (OH)
Angela Stanford, Gulf Coast Community College (FL)
John Thoo, Yuba College (CA)
Michael Turegun, Oklahoma City Community College
Joyce Wellington, Southeastern Community College (NC)
Henry Wyzinski, Indiana University-Northwest
Cora West, Florida Community College-Kent
Stephen Zona, Quinsigamond Community College

But, it is the McGraw-Hill staff who has suffered with us the most, so special thanks to them all.

Donald Hutchison
Louis Hoelzle

TO THE STUDENT

TO THE STUDENT

You are about to begin a course in basic mathematics. We made every attempt to provide a text that will help you understand what basic mathematics is about and how to effectively use it. We made no assumptions about your previous experience with mathematics. Your progress through the course will depend on the amount of time and effort you devote to the course and your previous background in math. There are some specific features in this book that will aid you in your studies. Here are some suggestions about how to use this book. (Keep in mind that a review of all the chapter and summary material will further enhance your ability to grasp later topics and to move more effectively through the text.

1. If you are in a lecture class, make sure that you take the time to read the appropriate text section *before* your instructor's lecture on the subject. Then take careful notes on the examples that your instructor presents during class.
2. After class, work through similar examples in the text, making sure that you understand each of the steps shown. Examples are followed in the text by *Check Yourself* exercises. Basic math is best learned by being involved in the process, and that is the purpose of these exercises. Always have a pencil and paper at hand, and work out the problems presented and check your results immediately. If you have difficulty, go back and carefully review the previous examples. Make sure you understand what you are doing and why. The best test of whether you do understand a concept lies in your ability to explain that concept to one of your classmates. Try working together.
3. At the end of each chapter section you will find a set of exercises. Work these carefully in order to check your progress on the section you have just finished. You will find the solutions for the odd-numbered exercises following the problem set. If you have had difficulties with any of the exercises, review the appropriate parts of the chapter section. If your questions are not completely cleared up, by all means do not become discouraged. Ask your instructor or an available tutor for further assistance. A word of caution: Work the exercises on a regular (preferably daily) basis. Again, learning basic math requires becoming involved. As is the case with learning any skill, the main ingredient is practice.
4. When finished with the last section of a chapter, try the *Self-Test* that appears at the end of each chapter. This test will give you an actual practice test to work as you review for in-class testing. Again, answers with section references are provided.
5. When you have completed Chapters 4, 7, 9, 11, and 14, review by using the *Summary*. You will find all the important terms and definitions in this section, along with examples, illustrating all the techniques developed since the previous Summary. Following the summary are *Summary Exercises* for further practice. The exercises are keyed to chapter sections, so you will know where to turn if you are still having problems.
6. Finally, an important element of success in studying basic math is the process of regular review. We provided a series of *Cumulative Tests* throughout the textbook, beginning at the end of Chapter 4. These tests will help you review not only the concepts of the chapter that you have just completed but those of previous chapters. Use these tests in preparation for any midterm or final exams. If it appears that you have forgotten some concepts that are being tested, don't worry. Go back and review the sections where the idea was initially explained, or the appropriate chapter summary. That is the purpose of the cumulative tests. We hope that you will find our suggestions helpful as you work through this material, and we wish you the best of luck in the course.

Donald Hutchison
Louis Hoelzle

CONTENTS

Preface ix

To the Student xvi

Chapter 1 Addition and Subtraction of Whole Numbers 1

Pretest for Chapter 1 2

1.1 The Decimal Place-Value System 3

1.2 The Properties of Addition 11

1.3 Adding Whole Numbers 19

1.4 Addition with Carrying 31

Using Your Calculator to Add 39

1.5 Rounding, Estimation, and Order 43

1.6 Subtraction of Whole Numbers 53

1.7 Subtraction with Borrowing 61
Using Your Calculator to Subtract 71

1.8 Measuring Perimeter 73

Self-Test for Chapter 1 79

Chapter 2 Multiplication of Whole Numbers 81

Pretest for Chapter 2 82

2.1 The Properties of Multiplication 83

2.2 Multiplying by a One-Digit Number 93

2.3 Multiplying by Numbers with More Than One Digit 101

2.4 Multiplying by Numbers Ending in Zero 111

2.5 The Order of Operations 119
Using Your Calculator to Multiply 123

2.6 Powers of Whole Numbers 127

2.7 Measuring Area and Volume 135

Self-Test for Chapter 2 143

Chapter 3 Division of Whole Numbers 145

Pretest for Chapter 3 146

3.1 The Language of Division 147

3.2 Division with Zero and One 155

3.3 Division by Single-Digit Divisors 159

3.4 Division by Multiple-Digit Divisors 167

3.5 Estimating the Results of Division 179

3.6 The Order of Operations 185
Using Your Calculator to Divide 189

3.7 Finding the Average of a Group of Numbers 193

Self-Test for Chapter 3 201

Chapter 4 Factors and Multiples 203

Pretest for Chapter 4 204

4.1 Prime and Composite Numbers 205

4.2 Writing Composite Numbers as a Product of Prime Factors 213

4.3 Finding the Greatest Common Factor (GCF) 223

4.4 Finding the Least Common Multiple (LCM) 231

Self-Test for Chapter 4 241

Summary for Chapters 1–4 243

Summary Exercises 247

Cumulative Test for Chapters 1–4 251

Chapter 5 Introduction to Fractions 255

Pretest for Chapter 5 256

5.1 The Language of Fractions 257

5.2 Proper Fractions, Improper Fractions, and Mixed Numbers 265

5.3 Equivalent Fractions 275

5.4 Simplifying Fractions 279

Using Your Calculator to Simplify
Fractions 289

5.5 Building Fractions 291

Self-Test for Chapter 5 303

Chapter 6 The Multiplication
and Division of
Fractions 305

Pretest for Chapter 6 306

6.1 Multiplying Fractions 307

6.2 Multiplying Fractions and Mixed
Numbers 311

Using Your Calculator to Multiply
Fractions 319

6.3 Simplifying Before Multiplying
Fractions and Mixed
Numbers 321

6.4 Dividing Fractions 335

Using Your Calculator to Divide
Fractions 347

Self-Test for Chapter 6 349

Chapter 7 Addition and
Subtraction of
Fractions 351

Pretest for Chapter 7 352

7.1 Adding Fractions with a Common
Denominator 353

7.2 Finding the Least Common
Denominator for Unlike
Fractions 361

7.3 Adding Unlike Fractions 365
Using Your Calculator to Add
Fractions 373

7.4 Subtracting Like and Unlike
Fractions 375

7.5 Adding and Subtracting Mixed
Numbers 385

Using Your Calculator to Add and
Subtract Mixed Numbers 403

Self-Test for Chapter 7 405

Summary for Chapters 5–7 407

Summary Exercises 411

Cumulative Test for Chapters 5–7 415

Chapter 8 Addition,
Subtraction, and
Multiplication of
Decimals 419

Pretest for Chapter 8 420

8.1 Place Value in Decimal
Fractions 421

8.2 Rounding Decimals 429

8.3 Adding Decimals 433

8.4 Subtracting Decimals 443

Using Your Calculator to Add and
Subtract Decimals 453

8.5 Multiplying Decimals 457

Using Your Calculator to Multiply
Decimals 465

8.6 Finding the Circumference and
Area of a Circle 469

8.7 Area and Unit Conversion 477

8.8 Multiplying Decimals by Powers
of Ten 485

Using Your Calculator to Multiply by
Powers of Ten 489

Self-Test for Chapter 8 491

Chapter 9 Decimals, Fractions,
and Square
Roots 495

Pretest for Chapter 9 496

9.1 Dividing Decimals by Whole
Numbers 497

9.2 Dividing by Decimals 505
Using Your Calculator to Divide
Decimals 517

9.3 Dividing Decimals by Powers
of 10 519

9.4 Converting Common Fractions to
Decimals 523

9.5 Converting Decimals to Common
Fractions 529

Using Your Calculator to Convert
Between Decimals and
Fractions 533

9.6 Square Roots and the
Pythagorean Theorem 537

Using Your Calculator to Find Square
Roots 54
Self-Test for Chapter 9 547
Summary for Chapters 8–9 549
Summary Exercises 551
Cumulative Test for Chapters 8 and
9 556

**Chapter 10 Ratio and
Proportion 559**

Pretest for Chapter 10 560
10.1 Using Ratios 561
10.2 The Language of Propor-
tions 569
10.3 Solving Proportions 577
Using Your Calculator to Solve
Proportions 593
Self-Test for Chapter 10 599

Chapter 11 Percent 601

Pretest for Chapter 11 602
11.1 Changing a Percent to a Fraction
or Decimal 603
11.2 Changing a Decimal or a
Fraction to a Percent 613
11.3 Identifying the Rate, Base, and
Amount 621
11.4 Three Types of Percent
Problems 629
11.5 Solving Application Problems
Involving Rate, Base, and
Amount 641
Using Your Calculator to Solve Percent
Problems 655
Self-Test for Chapter 11 661
Summary for Chapters 10–11 663
Summary Exercises 665
Cumulative Test for Chapters
10–11 669

Chapter 12 Graphs 673

Pretest for Chapter 12 674
12.1 The Number Line 675
12.2 Line Graphs and Bar
Graphs 679

12.3 Pie Charts 687
12.4 Creating Bar Graphs 691
Self-Test for Chapter 12 695

Chapter 13 Measurement 697

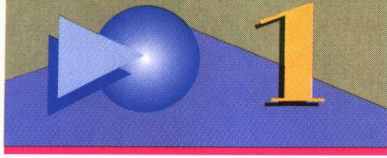
Pretest for Chapter 13 698
13.1 The Units of the English
System 699
13.2 Denominate Numbers 705
13.3 Metric Units of Length 715
13.4 Metric Units of Weight 727
13.5 Metric Units of Volume 733
Using Your Calculator to Convert
Between the English and Metric
Systems 739

**Chapter 14 Introduction to
Algebra 747**

Pretest for Chapter 14 748
14.1 The Integers 749
14.2 Adding and Subtracting Signed
Numbers 757
Using Your Calculator to Add and
Subtract Signed Numbers 773
14.3 Multiplying and Dividing Signed
Numbers 775
Using Your Calculator to Multiply and
Divide Signed Numbers 789
14.4 Evaluating Algebraic
Expressions 791
14.5 Solving Equations 799
Self-Test for Chapter 14 813
Summary for Chapters 12–14 815
Summary Exercises 821
Cumulative Test for Chapters
12–14 825

*Answers to Pretests, Even-
Numbered Section Exercises,
Calculator Exercises, Self-
Tests, Summary Exercises,
Cumulative Tests 827*

Index 837



ADDITION AND SUBTRACTION OF WHOLE NUMBERS

INTRODUCTION

Numbers were first used for counting people and objects. We still keep track of the number of people in our towns, states, and country. Every 10 years the U.S. government undertakes a complete count of the number of the people in the country. Such a count is called a *census*.

Rosita has worked for the Census Bureau since 1988. She helped organize, conduct, and audit the 1990 census, in which the government counted a total of 248,718,301 people in the United States. (As of July 1, 1996, the Census Bureau established the revised U.S. population at 265,283,783.) Rosita will be working on the census for the year 2000 until the final audit is completed, most likely in the year 2005.

