

# Contents

## **1. Arithmetic and the Teacher** **1**

Introduction • What is arithmetic? • Teaching arithmetic • Number systems • Operations with numbers • Rational numbers • Applied problems • Measurement and approximate numbers

## **2. Number and Its Representation** **16**

Counting • Cardinal and ordinal numbers • Systems of notation • Place-value systems of notation • Exponents • Place-value systems of notation using other bases • Numeration

## **3. Addition** **38**

Defining addition • Laws for the operation of addition • The counting frame • Methods of addition • Addition facts • Higher decade addition • Column addition • Addition of numbers represented by two- and three-digit numerals • Summary of addition • Checks for addition—the checks by casting out nines • The average and the median for a set of data • Addition using bases other than ten • More about addition

## **4. Multiplication** **59**

Introduction and definitions • Laws for multiplication • Suggestions for the development of the multiplication facts • The lattice method of multiplication • Making sure of multiplication facts • Progress in multiplication • Checks in multiplication • Errors in multiplication • Multiplication in other bases

**5. Subtraction 78**

Inverse operations • Introduction to subtraction • The basic subtraction facts • Higher decade subtraction • Subtraction methods • Methods of checking subtraction

**6. Division 91**

Definitions • More about division • Elementary aspects of division • Division with remainders • Single-digit divisors • The long-division algorithm • Two-digit divisors • The galley method of division • Short division • Checking division by casting out nines • Cumulative review

**7. More about Numbers 110**

Prime numbers • The sieve of Eratosthenes • A closer look at the first twenty-five primes • Composite numbers • Tests for divisibility • Determining whether a number is prime • Determining factors of a number • Greatest common divisor • Euclid's algorithm • Least common multiple • The number of primes is infinite • Some properties of the natural numbers • Perfect numbers

**8. Introduction to Measurement, Area, and Volume 131**

Introduction • Linear measure • Perimeter • The nature of  $\pi$  • Area • Formulas for areas of certain figures • Correspondence of linear and surface measure • Correspondence of surface measure and volume measure

**9. Introduction to Fractions 141**

Introduction to fractions • Definition • Reading fractions • Representing fractions • Uses of fractions • Kinds of fractions

**10. Operations with Fractions 154**

Introduction • Addition of fractions • Groups of examples in addition of fractions • Subtraction of fractions • Addition and subtraction of mixed numbers • Overcoming difficulties • Multiplication of fractions • Division involving fractions • Division involving mixed numbers • Fractional parts of one hundred

**11. Decimal Fractions 179**

Definitions • The decimal point notation • Reading decimal fractions • Exponent form for decimal fractions • Fractions in other number bases • Equivalent decimal fractions—similar decimal fractions • The fundamental operations and decimal fractions—decimal point notation • Significant figures—rounding off numbers • More about repeating decimals • Scientific notation for numbers

**12. Per Cent and Percentage 198**

Introduction • Per cents • The fundamental uses of per cent • Per cent increase and per cent decrease • Per cent equivalents of common fractions • Large and small per cents • Estimating and comparing per cents • Difficulties with per cent problems

**13. Further Applications of Per Cent 210**

Trade discount • Commission • Profit and loss • Income taxes • Real estate and personal property tax • Other applications of per cent

**14. Mental Arithmetic 221**

Mental arithmetic in the classroom • Types of problems to be solved mentally • Short cuts • Oral problems to review fundamental operations • Computing contests • Estimating and checking answers

**15. Approximate Numbers 230**

Introduction • Significant digits—rounding off numbers • Numerical operations with approximate numbers

**16. Denominate Numbers 238**

Introduction • Tables of common measure • Miscellaneous units of measure • Operations with denominate numbers • The metric system • Conversion factors for the English and metric systems

**17. Simple and Compound Interest 248**

Simple interest • Ordinary and exact simple interest • Further uses of the interest formula • Present value and discount • Compound interest • Present value

<b>18. General Monetary Applications</b>	<b>261</b>
Notes and bank discount • Installment buying • Stocks and bonds • Buying and selling stock • Buying and selling bonds	
<b>19. Introduction to Algebra</b>	<b>272</b>
Introduction • Use of formulas • Sets, solution sets, and equations • Signed numbers—operations • Rational numbers—operations • Equations and applications • Proportion • The field postulates of algebra • The rational numbers	
<b>20. Square Root and the Pythagorean Theorem</b>	<b>302</b>
Square root • Methods of finding the square roots of numbers • The Pythagorean theorem	
<b>21. An Introduction to Geometry</b>	<b>312</b>
Introduction—preliminary notions • Line and angle measure • More about triangles • Constructions • Congruent, similar, and equal triangles • Areas of plane geometrical figures • The arithmetic of common solids • The regular polyhedrons	
<b>Appendix A. Instructional Materials. Visual Aids</b>	<b>343</b>
Introduction and purpose • Class visitation • General requirements for visual aids and instructional materials • Films and filmstrips • Kits, cards, charts, and boards • Miscellaneous instructional materials • Games centering around arithmetic • Bulletin board	
<b>Appendix B. Notes on Number Theory</b>	<b>366</b>
Proof of Euclid's theorem on perfect numbers • A proof that $\sqrt{2}$ is irrational • A proof of Euclid's algorithm	
<b>Appendix C. Bibliography</b>	<b>369</b>
<b>Answers to Odd-Numbered Exercises</b>	<b>372</b>
<b>Index</b>	<b>383</b>