

TABLE OF CONTENTS

HOW THIS MANUAL CAN BE USED	1
INTRODUCTION	3
THE BASIC OPERATIONS	6
Addition	11
Background Information	11
Activity 1: Finding Sums on the Addition Strip Board	14
Activity 2: Finding Essential Combinations on the Addition Strip Board ...	16
Activity 3: Adding with Zero on the Addition Strip Board	18
Activity 4: Doubling Addends on the Addition Strip Board	19
Activity 5: Using Addition Chart 3	20
Activity 6: Using Addition Chart 5	22
Activity 7: Bingo Game with Addition Chart 6	24
Activity 8: Oral Games to Memorize Addition Facts	26
Activity 9: Learning About the Basic Formats of Addition	28
Activity 10: Addition Snake Game	30
Subtraction	34
Background Information	34
Activity 1: Using the Subtraction Strip Board	36
Activity 2: Using Subtraction Chart 2	38
Activity 3: Bingo Game with Subtraction Chart 3	40
Activity 4: Oral Games to Memorize Subtraction Facts[h4]	42
Activity 5: Learning About the Basic Formats for Subtraction	44
Activity 6: Negative Snake Game	46
Multiplication	51
Background Information	51
Activity 1: Using the Multiplication Bead Board	54
Activity 2: Finding Combinations of Numbers on the Multiplication Bead Board	56
Activity 3: Using Multiplication Chart 3	57
Activity 4: Using Multiplication Chart 4	59
Activity 5: Using Multiplication Chart 5	61
Activity 6: Oral Games to Memorize Multiplication Facts	63
Activity 7: Learning About the Basic Formats of Multiplication	65
Activity 8: Skip Counting using the Short Bead Chains	67
Activity 9: Skip Counting using the Long Bead Chains	69
Activity 10: Building the Decanomial	72

Activity 11: Building the Decanomial Diagonally	75
Activity 12: Multiplying by 10	77
Activity 13: Multiplying by Powers of 10, Using the Golden Bead Material	120
Division	81
Background Information	81
Activity 1: Using the Division Board	83
Activity 2: Using Division Control Chart 1	85
Activity 3: Using Division Chart 2	87
Activity 4: Oral Games for the Memorization of Division	89
Activity 5: Learning About the Basic Formats of Division	91
 MULTIPLICATION AND DIVISION: MOVING TOWARD ABSTRACTION	93
Introduction	93
Multiples and Factors	95
Background Information	95
Activity 1: Finding Multiples using Colored Bead Bars	98
Activity 2: Learning About Multiples Using the Algebraic Pegboard	100
Activity 3: Finding the Lowest Common Multiple	102
Activity 4: Graphing Multiples on the Chart of Multiples	104
Activity 5: Learning About Multiples Using the Multiples Tables	106
Activity 6: Learning About Prime Numbers Using Multiples Table C	108
Activity 7: Learning About Factors Using the Algebraic Pegboard	110
Activity 8: Identifying Prime Factors	113
Activity 9: Identifying Prime Factors Using the Algebraic Pegboard	115
Activity 10: Building Lowest Common Multiples from Prime Factors	117
Activity 11: Using Prime Factors to Find Lowest Common Multiples and Highest Common Factors	119
 Multiplication and Division with the Golden Bead Material	122
Background Information	122
Activity 1: Learning About Geometrical Multiplication	124
Activity 2: Doing Short Division with the Golden Beads	126
Activity 3: Practicing Long Division with Golden Beads	128
Activity 4: Dividing a 3-digit dividend by a 2-digit divisor with Golden Beads	130

HIERARCHIES OF NUMBERS	133
Introduction	133
Understanding the Hierarchy of Numbers	138
Background Information	138
Activity 1: Learning About Geometric Representation to 1,000,000	140
Activity 2: Learning About Numerals to 1,000,000	142
Bead Frames	144
Background Information	144
Activity 1: Exploring the Small Bead Frame	146
Activity 2: Using the Small Bead Frame and Notation Paper	148
Activity 3: Adding with the Small Bead Frame	150
Activity 4: Adding with Exchanging, Using the Small Bead Frame	152
Activity 5: Subtracting Using the Small Bead Frame	154
Activity 6: Subtracting with Exchanging, Using the Small Bead Frame ..	156
Activity 7: Multiplying with the Small Bead Frame	158
Activity 8: Exploring the Large Bead Frame	160
Activity 9: Using the Large Bead Frame and Notation Paper	162
Activity 10: Multiplying with the Large Bead Frame	164
Activity 11: Learning About Geometrical Multiplication	166
Activity 12: Multiplying by 1-Digit, Using the Flat Bead Frame	168
Activity 13: Multiplying by 2-Digits, Using the Flat Bead Frame	170
Place Value Multiplication	172
Background Information	172
Activity 1: Exploring the Checkerboard	173
Activity 2: Multiplying by 1-Digit Numbers, Using the Checkerboard	177
Activity 3: Multiplying by 2-Digit Numbers, Using the Checkerboard	180
Activity 4: Drawing Using the Checkerboard	183
Activity 5: Bank Game	187
Long Division	190
Background Information	190
Activity 1: Exploring Long Division	191
Activity 2: Dividing by 1-Digit Numbers Without Remainders, Using Long Division Material	192
Activity 3: Dividing by 1-Digit Numbers with Remainders, Using Long Division Material	194
Activity 4: Dividing by 2-Digit Numbers Using Long Division Material	196

RESOURCES FOR TEACHERS AND STUDENTS	199
Print	199
Web	202
Audio/Video	205
TEMPLATES FOR TEACHERS	207
MATERIAL LIST	229