Contents

Chapter 1	Sets, Problem Solving, and Counting Numbers	
1.0	Introduction	1
1.1	The Language of Sets	5
1.2	Relations on Sets	11
1.3	Cardinal Numbers	20
1.4	Operations on Sets	27
1.5	Properties of Operations on Sets	36
1.6	Addition of Counting Numbers	41
1.7	Multiplication of Counting Numbers	48
1.8	Subtraction and Division of Counting Numbers	54
1.9	The Ordering of Counting Numbers	59
1.10	Mathematical Structure	63
Chapter 2	Numeration Systems	
2.1	Introduction	71
2.2	The Hindu-Arabic System	72
2.3	Ancient Systems	74
2.4	Exponential Notation	78
2.5	Positional Numeration Systems	81
2.6	The Addition Algorithm	95
2.7	The Subtraction Algorithm	103
2.8	The Multiplication Algorithm	108
2.9	The Division Algorithm	116
Chapter 3	Number Theory	
3.1	Introduction	125
3.2	Divisibility Concepts	125
3.3	Some Divisibility Rules	129
		i

2.4	D. 1.0 4 N. 1	135
3.4		
3.5	More About Number Theory	142
3.6	Greatest Common Divisor	148
	Least Common Multiple	151
3.8	The Integers	156
3.9	Addition of Integers	159
3.10	Multiplication of Integers	166
3.11	More About Addition and Multiplication of Integers	168
3.12	Subtraction and Division of Integers	171
3.13	Equations and Inequalities	177
Chapter 4	Numbers: Rational and Irrational	
4.1	Introduction	183
4.2	The Rational Numbers	183
4.3	Addition of Rational Numbers	190
4.4	Multiplication of Rational Numbers	199
4.5	Subtraction and Division of Rational Numbers	207
4.6	Order in the Set of Rational Numbers	216
4.7	Decimals	221
4.8	Infinite Repeating Decimals	235
4.9		242
4.10	The Real Number System	250
	Using Real Numbers to Solve Problems	252
Chapter 5	Geometric Shapes	
5.1	Introduction	263
5.2	Some Basic Ideas	263
5.3	Lines and Planes	271
5.4	Separation	277
5.5	Rays and Angles	278
5.6	Plane Curves	285
5.7	Sets of Points in Three-Space	294
Chapter 6	Linear and Angular Measurement	
6.1	Introduction	301
6.2	Standard Linear Units of Measure	303
6.3	More on Linear Measurement and Estimation	310
6.4	Angular Measure	321
6.5	Triangles	327
6.6	Constructions	333
6.7	Congruence and Similarity	340
6.8	Congruence via Motion Geometry	351
	•	

		xi
		CONTENTS
6.9	Pythagorean Theorem	361
6.10	Quadrilaterals	368
	Prisms Revisited	372
6.12	Regular Polygons and Symmetry	378
6.13	Regular Polyhedrons	385
Chapter 7	Area and Volume	
7.1	Area	397
7.2	Developing Area Formulas	403
7.3	Area Formulas and Other Geometric Relationships	416
7.4	Area of a Circular Region	420
7.5	Prisms	426
	Cylinders	428
7.7	Pyramids	433
	Cones	437
7.9	Spheres	440
	Volume	443
	Volume of Right Circular Cylinders and Spheres	446
	Volume of Pyramids and Cones	450
7.13	Summary of Formulas	456
Chapter 8	Coordinate Geometry	
8.1	Coordinate Geometry on a Line	459
8.2	The Rectangular Coordinate System	461
8.3	Slope	469
8.4	Graphing on a Number Line	476
8.5	Graphing on a Coordinate Plane	477
8.6		482
8.7	Determining Equations of Straight Lines	488
Chapter 9	Probability	
9.1	Introduction	499
9.2	Some Basic Probability Concepts	499
9.3	Counting Techniques to Help with Probability	507
9.4	More on the Fundamental Principle of Counting and Probability	514
9.5	Some Useful Properties of Probability	520
9.6	Odds and Mathematical Expectation	527
B	Statistics: Uses and Misuses	

537

538

10.1 Introduction

10.2 Collecting Data: Sampling

XIICONTENTS

10.3	Organizing Data	542
10.3		549
		560
10.5		569
10.6	-	576
10.7	Using the Standard Deviation	570
Chapter 11	An Introduction to Computers and the Language BASIC	
11.1	Introduction	585
		586
11.2	Calculating Devices: From Fingers to Computers	593
11.3	Computers and Algorithms	601
11.4	BASIC	609
11.5	BASIC Arithmetic	615
11.6	GO TO and IF-THEN Statements	627
11.7	FOR-NEXT Loops	
	Bibliography	641
	Appendix A. Informal Logic	643
	A1. Statements	643
	A2. Conditions and Biconditionals	647
		651
	A3. Quantifiers	655
	Appendix B: Table of Square Roots, Squares	A1
	Answers for Selected Problems	I1
	Index	