

CONTENTS

Preface	vii
Introduction	1
1. The Exploratory Process	3
2. Exploring with a Calculator	8
3. A Mathematical Excursion	18
4. A Mathematical Expedition	24
5. A Computer-assisted Exploration	34
6. Twenty Mathematical Excursions	53
1. The Diagonal Intruder	53
2. Finding the Correct Postage	54
3. Do You Accept Gold Chains?	55
4. A Circular Massacre	56
5. Inverting a Triangle	58
6. Slicing Cheese	59
7. Phun with Physics	60
8. Number Building in the World of Unit Fractions	61
9. Number Necklaces	62
10. The Consecutive Index	63
11. Pool, Anyone?	64
12. Three-Dimensional Pool	66
13. What Route Shall I Take Today?	68
14. The Square Root of 2 or Bust	70
15. Primes inside Number Spirals	72

16.	You Can Get Group Therapy for Just Pennies	73
17.	Marriage Counseling for the Natural Numbers	74
18.	Don't Waste the Missiles	76
19.	The Perfect Shuffle	77
20.	Making Triangles out of Sausage Links	78
7.	Twenty Mathematical Expeditions	79
21.	The Genealogy of Natural Numbers	79
22.	World Records for Triangles on a Geoboard	82
23.	Circling the Square	84
24.	The Check Is in the Mail	86
25.	Squares within Squares and Cubes within Cubes	87
26.	Triangles within Triangles	89
27.	The First One to the Origin Wins	91
28.	Mathematics and String Art	92
29.	You Can't See the Forest for the Trees	93
30.	A Population Explosion of Rational Numbers	94
31.	A Population Explosion on the Rational Circle	97
32.	A Cheap Ruler	99
33.	Balance Scales Expose Counterfeit Coin	102
34.	Building Numbers the Egyptian Way	104
35.	Pool with Real Pockets	106
36.	Sightings of the Rare Primitive Pythagorean Triangle	108
37.	Sightings of the Uncommon Heron Triangle	110
38.	The Classic Matchup: Heads or Tails	112
39.	Sharing the Candy	114
40.	Cutting a Diamond	116
8.	Twenty Computer-assisted Explorations	117
41.	A March to the North Pole	117
42.	The Fibonacci Factor	119
43.	Periodic Fractions	120
44.	The Universe of Fractions with a Prime Denominator	121
45.	Aw, C'mon, Coach, I'll Be Here All Day	125
46.	I'll Take the Lamborghini	128
47.	The Number 1 Is Truly #1	130
48.	Pythagorean Stars in the Night Sky	133
49.	A Plethora of Patterns in Continued Fraction Expansions	134

50. A Bridge of Cards with a Harmonic Span	137
51. A Snow Job	141
52. Are the Natural Numbers Overweight?	145
53. Making Triangles out of Straws	147
54. Making Triangles out of Cardboard Strips	149
55. Bring Your Social Security Card	151
56. How Many Small Numbers Make a Big Number?	153
57. Conflict among the Natural Numbers	155
58. Earthquakes on the Real Line	158
59. A Hailstorm Strikes the Natural Numbers	160
60. The Battle of Trafalgar	162
Appendix	165
Suggested Reading	167