

CONTENTS

PREFACE *ix*

QUADRANT ONE

NUMBERS AND NUMERALS

- 1° Rational digits, 3
- 2° Chinese rod, or stick, numerals, 4
- 3° The Babylonian zero, 4
- 4° Papuan body counting, 6
- 5° A curious passage in the Papuan Bible, 7
- 6° Three for plural, 7
- 7° Peak-finger days, 8
- 8° Number gestures, 8
- 9° The earliest mathematical artifact, 9
- 10° Kononto, 9
- 11° Number taboos, 9
- 12° Our mixed culture, 11
- 13° The eleventh commandment, 11
- 14° A fair approximation, 11
- 15° A significant truth, 11
- 16° Fibonacci humor, 11
- 17° The ubiquitous number five, 11
- 18° Some more Pythagoreanism?, 13
- 19° Number mysticism, 14
- 20° Giving credit to man, 14
- 21° Giving credit to diety, 14
- 22° The Kensington stone mystery, 15
- 23° The gelosian algorithm, 17
- 24° The galley algorithm, 18

CONTENTS

BIG NUMBERS

- 25° The Tower of Hanoi, 20
- 26° The number $2^{64} - 1$ again, 21
- 27° Ancestors, 21
- 28° Incredible, 22
- 29° Googol and googolplex, 22
- 30° Eddington's number, 23
- 31° An amplification factor, 23
- 32° Skewes' number, 23
- 33° Perhaps the most remarkable numerical statement in English literature, 24
- 34° A seventeenth-century pun by Richard Lovelace, 24
- 35° The square root of infinity, 24
- 36° The mathematicians' love-knot, 25

PI

- 37° π in Biblical times, 25
- 38° An ancient Egyptian estimation of π , 25
- 39° An interesting rational approximation of π , 26
- 40° The Ludolphine number, 28
- 41° Mnemonics for π , 28
- 42° A brief chronology of the calculation of π by infinite series, 29
- 43° The irrationality and the transcendentality of π , 30
- 44° The normalcy of π , 30
- 45° Brouwer's question, 31
- 46° π by legislation, 32
- 47° Morbus cyclometricus, 33

GEMATRIA

- 48° Latin beasting, 34
- 49° Greek beasting, 34
- 50° Turning the tables, 35
- 51° The greatest political figure, 35
- 52° Amen, 35
- 53° The Nile identified as the year, 35

COUNTING BOARDS

- 54° "The Hands," 37
- 55° The return of the abacus to western Europe, 37
- 56° The number tree, 38

CONTENTS

- 57° The abacus as part of our culture, 39
- 58° Origin of the verb "to compute," 39
- 59° A recurring simile, 40
- 60° Das Hundert ins Tausend werfen, 40
- 61° Our final accounting, 41
- 62° A deception, 41
- 63° Political pamphlets of the day, 41

TALLY STICKS

- 64° Some primitive tallies, 41
- 65° Tally sticks, 42
- 66° Pictographic evidence of the tally stick and the counting board in Chinese culture, 43
- 67° Tally sticks and the burning of Parliament, 44
- 68° A simple tally stick, 45
- 69° The English word "score," 45
- 70° Etymology of some business terms, 45
- 71° Multiple tally stick, 46

COMPUTERS

- 72° An analogy, 47
- 73° Speed, 47
- 74° A cartoon by P. Barlow, 47
- 75° A cartoon by J. Mirachi, 47
- 76° Watch out, 48
- 77° The supercomputer, 48
- 78° And cheaper to produce, 48

WEIGHTS AND MEASURES

- 79° Concerning lengths and areas, 48
- 80° Measure for measure, 50
- 81° Knots that are not knots, 50
- 82° Concerning volumes, 50
- 83° Concerning weights, 51
- 84° Tonnage, 52
- 85° Concerning former British currency, 52
- 86° Early programs for obtaining a standard unit of length, 53
- 87° A calamitous mistake, 54
- 88° A piece of neutral land, 55

CONTENTS

- 89° Errors, 55
- 90° Advance of the metric system, 58

QUADRANT TWO

SYMBOLS AND TERMINOLOGY

- 91° Whitehead on + and -, 61
- 92° Gauss on +1, -1, and $\sqrt{-1}$, 61
- 93° An odious notation, 61
- 94° Figuratively speaking, 62
- 95° The earliest symbol in mathematical logic, 62
- 96° A symbol for division, 63
- 97° Misplaced credit, 63
- 98° Pound sterling and pound weight, 63
- 99° Penny and pennyweight, 64
- 100° Shillings, 64
- 101° Ounce, 64
- 102° Percentage, 64
- 103° Backward people, 65
- 104° A brief history of the dollar mark, 65
- 105° Discarded by the printer, 66
- 106° Quod erat demonstrandum, 67

ARITHMETIC AND ALGEBRA

- 107° Ethical arithmetic, 67
- 108° Thorough job, 67
- 109° Living costs a century ago, 68
- 110° Empty set, 69
- 111° Half nuts, 69
- 112° Buying grapefruit, 69
- 113° Thoroughly logical, 70
- 114° Modern method, 70
- 115° Of course, 70
- 116° Remains to be seen, 70
- 117° Algebraic lines from Lewis Carroll, 70
- 118° One degree more abominable, 70
- 119° The Josephus problem, 71
- 120° Mathematical induction, 72
- 121° The principle of the smallest natural number, 73

- 122° Inverse golden rule, 73
 123° The skeleton key of mathematics, 73
 124° Immortality, 73

GEOMETRY

- 125° Presence of body, 74
 126° Definition, 74
 127° Vocational mathematics, 74
 128° The intellectual castaway, 74
 129° D'Alembert on geometry, 74
 130° The Pythagorean theorem, 75
 131° The key to analytic geometry, 75
 132° Space communication, 76
 133° Where Euclid failed, 76
 134° A crackpot, 76
 135° Curves with proper names, 77
 136° Inversion, 77
 137° Catching lions, 77
 138° The oui-ja board curve, 80
 139° Anna, 81
 140° Paul Kelly on non-Euclidean geometry, 83

TRIGONOMETRY

- 141° Striking out, 83
 142° Functional grammar, 84
 143° A Clayton Dodge whimsy, 84
 144° Pie in the bathroom, 84
 145° The happiest mnemonic in elementary mathematics, 84
 146° A knowledge of trigonometry, 86

PROBABILITY AND STATISTICS

- 147° Significant figures, 86
 148° The breathy baboon, 86
 149° A remarkable probability, 87
 150° Unlikely, 87
 151° Choice, not chance, 87
 152° To be fair, 87
 153° Something certain about the probable, 87
 154° Faith in a traditional event, 87
 155° Specious statistics, 88

CONTENTS

- 156° Statistical prediction, 88
- 157° A resolution, 88
- 158° Volvos, 88
- 159° Degrees of classification, 89
- 160° Railroad statistics, 89
- 161° Enumeration, 89
- 162° Extrapolation, 89

LOGIC

- 163° Paradoxes, 89
- 164° The antinomies of logic, 89
- 165° Logic, 90
- 166° Logic for the illogical, 90
- 167° Proof by logic, 90
- 168° An invalid proof, 91
- 169° How Abraham Lincoln improved his power of logic, 92
- 170° Bertrand Russell "proves" he is the Pope, 93

TOPOLOGY

- 171° Bilateral and unilateral surfaces, 93
- 172° The Möbius strip, 94
- 173° The burleycue dancer, 94
- 174° A river with only one bank, 95
- 175° The witch doctor, 95
- 176° The frustrated painters, 95
- 177° Klein's bottle, 95
- 178° College daze, 95
- 179° Jordan's theorem, 95
- 180° Protestant curves, 97

QUADRANT THREE

FROM THE YOUNGER SET

- 181° A cartoon by Whitney Darrow, Jr., 101
- 182° A cartoon by Alan Dunn, 101
- 183° The aftermath of the new math, 101
- 184° Cuisinaire rods, 101
- 185° Boners and bloopers, in twenty-five minute doses, 102

CLASSROOM TACTICS AND ANTICS

- 186° A penetrating remark, 103
 187° An empty stomach, 103
 188° Sneezing, 103
 189° A pointed remark, 104
 190° Advice prior to giving a mathematics test, 104
 191° Always read your problem carefully, 104
 192° Misdirection, 105
 193° Italian demonstration, 106
 194° Covering—open or closed?, 106
 195° See?, 106
 196° A high school for mathematics, 106
 197° Twenty-third slam, 109
 198° Oral examination procedures, 109

MATHEMATICIANS AND MATHEMATICS

- 199° E. H. Moore's dictum on theory, 111
 200° E. H. Moore's dictum on rigor, 111
 201° Rigor and rigor mortis, 111
 202° Gauss's second motto, 111
 203° Modern mathematics and primitive ritual, 111
 204° A mathematician's prayer, 112
 205° A mathematician's brains, 112
 206° Technique of problem solving, 113
 207° Esthetic of problem solving, 113
 208° Something to keep in mind, 113
 209° An impartial account of Western mathematics, 113
 210° An historic moment in mathematics, 113
 211° A principle of discovery, 114
 212° Mathematical density, 114
 213° D'Alembert on mathematics, 114
 214° Dugald Stewart on mathematics, 114
 215° Thomas Hill on mathematics, 115
 216° The mathematician and his methods, 116
 217° The researchers and the teacher, 116
 218° Mental mathematics, 116
 219° Test question, 116
 220° Occupational test, 117
 221° The mathematician, 117
 222° A place for credulity, 117

CONTENTS

- 223° Five quotes from Novalis, 118
- 224° Teaching versus research, 118
- 225° Publication and reward, 118
- 226° A hazardous occupation, 118

WOMEN OF MATHEMATICS

- 227° How Sophie Germain was led to the study of mathematics, 120
- 228° Sophie Germain as M. Le Blanc, 121
- 229° How Sonja Kovalevsky was led to the study of mathematics, 122
- 230° How Sonja Kovalevsky got to study in Germany, 122
- 231° Weierstrass's favorite pupil, 123
- 232° Sonja Kovalevsky's motto, 124
- 233° Why Emmy Noether became an algebraist, 124
- 234° Einstein's tribute to Emmy Noether, 124
- 235° Landau on Emmy Noether, 125

WHEREIN THE AUTHOR IS INVOLVED

- 236° A pair of old debts, 125
- 237° In memory of Dr. William E. Taylor, 126
- 238° The mathematician and the fundamentalist, 126
- 239° A Hoggatt witticism, 127
- 240° All good books are read, 127
- 241° Moving to Gorham, 128
- 242° Adam and Eve, 128
- 243° Mr. S. T. Thompson, 128
- 244° Professor Euclide Paracelso Bombasto Umbugio, 129
- 245° An amusing incident in the life of an editor, 129
- 246° Securing Wiener's hat for my mathematical museum, 131
- 247° Securing a lock of Einstein's hair for my mathematical museum, 131
- 248° Securing Hardy's scarf for my mathematical museum, 132
- 249° A doubtful acquisition for my mathematical museum, 132

NICOLAS BOURBAKI

- 250° A polycephalic mathematician, 134
- 251° The origin of the name Bourbaki, 134
- 252° Bourbaki's application for membership, 135
- 253° Charge and countercharge, 135
- 254° Correcting an error, 136
- 255° The model for Bourbaki, 136
- 256° A ball of tangled yarn, 136

CONTENTS

- 257° How Bourbaki works, 137
- 258° Oil for the lamp, 137
- 259° Worthy of imitation, 138
- 260° The University of Nancago, 138

ARCHIMEDES TO SIDNEY CABIN

- 261° Archimedes' tomb found, 138
- 262° A sizeable breakfast, 139
- 263° War and peace, 139
- 264° A Benjamin Banneker problem, 140
- 265° Great grandson of an African king, 141
- 266° A good reason, 141
- 267° Another good reason, 141
- 268° A paper in "The Physical Review," 142
- 269° A commemoration, 142
- 270° Well integrated person, 142

QUADRANT FOUR

CAUCHY TO COOLIDGE

- 271° Cauchy's early recognition, 145
- 272° Cauchy's productivity, 145
- 273° Cauchy's bigotry, 145
- 274° Cauchy and the oath of allegiance, 146
- 275° Cauchy's last words, 147
- 276° Cayley and Sylvester on Euclid, 147
- 277° Cayley and Tait on quaternions, 147
- 278° Some of William Kingdon Clifford's personal characteristics, 147
- 279° Professor Coolidge and examinations, 148
- 280° Professor Coolidge's test, 148

DEDEKIND TO GERBERT

- 281° An incorrect obituary, 149
- 282° Competition for Professor Lee Swinford, 149
- 283° Dido's problem, 149
- 284° Related to Dido's problem, 150
- 285° The sad case of Maurice de Duffahel, 150
- 286° Expert extraordinary, 150
- 287° Dire extremity, 151

CONTENTS

- 288° Fejér's wit, 151
- 289° More of Fejér's wit, 152
- 290° The Gerbert riddle, 152

HAMILTON AND HARDY

- 291° How Hamilton was taken, 153
- 292° How Hamilton became interested in mathematics, 153
- 293° Hamilton's alarm clock, 154
- 294° A Hamilton quote, 154
- 295° Hardy and the Riemann hypothesis, 154
- 296° Hardy criticizes Pólya, 155
- 297° Hardy and sports, 155
- 298° Hardy tries to outsmart God, 155
- 299° Another attempt by Hardy to outsmart God, 156
- 300° Hardy and mirrors, 156
- 301° International understanding, 156

HEILBRONN TO HURWITZ

- 302° On age, 156
- 303° An unlikely thought, 157
- 304° Hilbert and the Riemann hypothesis, 157
- 305° Hilbert's absent-mindedness, 157
- 306° Hilbert receives a new professor, 157
- 307° Euclid's "Elements" and Hilbert's dictum, 158
- 308° Got his number, 158
- 309° The aphoristician, 159
- 310° Pushed too far, 159

KASNER TO LAWRENCE

- 311° Student activity, 159
- 312° Proper subset, 160
- 313° Hopeful attitude, 160
- 314° A self reference, 160
- 315° Transformation, 160
- 316° Lagrange's dictum, 160
- 317° A celestial surprise, 161
- 318° Consistent or inconsistent?, 161
- 319° Laplace's last words, 161
- 320° Mathematics as a science, 161

CONTENTS

MILLER TO NEWTON

- 321° Point well taken, 161
- 322° A tour de force, 162
- 323° The problem of neighboring domains, 162
- 324° Father and son, 163
- 325° A tea-and-sugar problem, 163
- 326° Trivial, 163
- 327° The relation between A and B , 163
- 328° Newton and the keeping of accounts, 163
- 329° Newton's epitaph, 164
- 330° Wilson on monuments to Newton and Shakespeare, 164
- 331° Pope and Hill on Newton, 164

PEANO TO SWIFT

- 332° Peano and his space-filling curve, 164
- 333° Proper punishment, 165
- 334° Point of view, 166
- 335° Russell's nightmare, 166
- 336° Why Shī Huang-ti burned the books, 166
- 337° A malapropism, 167
- 338° One for the book, 167
- 339° Sturm and his theorem, 167
- 340° The astonishing prediction in "Gulliver's Travels," 168

SYLVESTER TO WHITEHEAD

- 341° An incident in Sylvester's early life, 169
- 342° An incident in Sylvester's later life, 170
- 343° The mathematical Adam, 170
- 344° Sylvester's papers, 170
- 345° Sylvester as a teacher, 170
- 346° The mathematics of golf, 171
- 347° William Thomson and the old Highlander, 171
- 348° William Thomson and his students, 172
- 349° Titles, 172
- 350° What is a mathematician?, 172
- 351° Von Karman's absent-mindedness, 172
- 352° A late comer, 173
- 353° Late for class, 173
- 354° Stamp of approval, 174

CONTENTS

NORBERT WIENER

- 355° Norbert Wiener parks his car, 175
- 356° Norbert Wiener moves, 175
- 357° Wiener finds the sought word, 175
- 358° Norbie, 176
- 359° Wiener's start in mathematics, 176
- 360° Professor Wiener's famous letter, 176

INDEX, 179