

# Contents

Preface to the Revised Edition	vii
1 Introduction	1
1.1 History . . . . .	1
1.2 Numerology . . . . .	1
1.3 The Pythagorean Problem . . . . .	2
1.4 Figurate Numbers . . . . .	4
1.5 Magic Squares . . . . .	7
2 Primes	15
2.1 Primes and Composite Numbers . . . . .	15
2.2 The Sieve of Eratosthenes . . . . .	17
2.3 Mersenne Primes . . . . .	19
2.4 Fermat Primes . . . . .	22
3 Divisors of Numbers	25
3.1 The Fundamental Factorization Theorem . . . . .	25
3.2 Divisors . . . . .	27
3.3 Problems Concerning Divisors . . . . .	29
3.4 Perfect Numbers . . . . .	31
3.5 Amicable Numbers . . . . .	33
4 Divisors and Multiples	35
4.1 Greatest Common Divisor . . . . .	35
4.2 Relatively Prime Numbers . . . . .	37
4.3 Euclid's Algorithm . . . . .	38
4.4 Least Common Multiple . . . . .	41
5 The Pythagorean Theorem	43
5.1 Preliminaries . . . . .	43
5.2 Solving the Pythagorean Equation . . . . .	44
5.3 Pythagorean Triangles . . . . .	47
5.4 Related Problems . . . . .	50
5.5 Fermat's Last Theorem . . . . .	53

6	Number Systems	57
6.1	Numbers for the Millions . . . . .	57
6.2	Other Systems . . . . .	58
6.3	Comparing Number Systems . . . . .	61
6.4	Early Calculating Devices . . . . .	64
6.5	Computers and their Number Systems . . . . .	66
6.6	Cryptarithms . . . . .	68
7	Congruences	73
7.1	What is a Congruence? . . . . .	73
7.2	Properties of Congruences . . . . .	74
7.3	The Algebra of Congruences . . . . .	76
7.4	Powers of Congruences . . . . .	78
7.5	Fermat's Little Theorem . . . . .	80
7.6	Euler's Phi Function . . . . .	83
8	Applying Congruences	87
8.1	Checking Computations . . . . .	87
8.2	The Days of the Week . . . . .	91
8.3	Tournament Schedules . . . . .	95
8.4	Prime or Composite? . . . . .	97
9	Cryptography	101
9.1	Secret Codes . . . . .	101
9.2	Caesar Ciphers . . . . .	102
9.3	Vigenère Ciphers . . . . .	105
9.4	Public Key Ciphers . . . . .	108
10	Solutions to Selected Problems	115
	References	129
	Index	131