

Contents

1	Introduction	1
1.1	To the Content of the Book	1
1.2	On the State of Mathematical Historical Research	3
	References	10
2	How Greek Science Began	11
2.1	The Origins of Mathematics	15
2.2	The Greek Numeral Symbols	18
2.3	The Greek School	21
	Further Reading	25
3	Thales of Miletus	27
3.1	Mathematical Work	27
3.2	More Reports on Thales	32
	Further References	35
4	Pythagoras and the Pythagoreans	37
4.1	Pythagoras of Samos	37
4.2	The Pythagoreans	42
4.3	Mathematical Discoveries of the Pythagoreans	44
4.4	Figured Numbers	46
4.5	Pythagoras' Theorem	51
4.6	Pythagorean Number Triplets	53
4.7	Heronian Triangles and Applications	56
4.8	Pythagoras and Music	57
	Further References	62
5	Hippocrates of Chios	63
5.1	Quadratures According to Alexander of Aphrodisias	65
5.2	Quadratures According to Eudemos	66
	References	69
6	Athens and the Academy	71
6.1	Athens	71
6.2	The Academy	74
6.3	The Mathematicians of the Academy	77

6.4	Eudoxus of Knidus	78
6.5	Theodorus of Cyrene	81
6.6	Theaitetos of Athens	82
	References	83
7	Plato	85
7.1	Plato's Most Beautiful Triangles	88
7.2	From the Book Menon	90
7.3	Platonic Solids	94
7.4	Plato's Lambda	99
7.5	The Role of Mathematics in Plato	101
	Further References	103
8	Aristotle and the Lyceum	105
8.1	Life and Work of Aristotle	105
8.2	Mathematics with Aristotle	111
	References	116
9	Alexandria	117
9.1	The Library	124
	Further References	129
10	Euclid of Alexandria	131
10.1	From Book I of the Elements	137
10.2	From Book II of the Elements	141
10.3	The Circle Theorems in Book III	146
10.4	Perfect and Friendly Numbers	148
10.5	The Euclidean Algorithm	150
10.6	Euclid's Theorem on Primes	152
10.7	The Parallel Axiom	153
10.8	Equivalent Postulates to the Parallel Axiom	154
10.9	Book of Area Divisions	160
	Further References	163
11	The Classical Problems of Greek Mathematics	165
11.1	Incommensurability	165
11.2	The Constructability According to Euclid	166
11.3	Angle Trisection	168
11.4	Squaring the Circle	173
11.5	Doubling the Cube	173
11.6	Constructability of the Pentagon	174
11.7	Constructibility of the Heptagon	175
11.8	Quadratures of Lunes	176
11.9	The Division in extreme and mean ratio (EMR)	179
	Further References	185

12	Archimedes of Syracuse	187
12.1	On the Centers of Gravity	190
12.2	Problem of the Broken Chord	191
12.3	The Regular Heptagon	192
12.4	The Book of Measuring the Circle	194
12.5	From the Book of Spirals	196
12.6	The Book of Lemmata	201
12.7	The Quadrature of the Parabola	209
12.8	The Palimpsest	212
12.9	The Stomachion	213
12.10	The Method, Theorem 2	215
12.11	Archimedes' Tomb Figure	217
12.12	More Works by Archimedes	220
	References	221
13	Eratosthenes of Cyrene	223
13.1	Eratosthenes as a Mathematician	224
13.2	Eratosthenes as a Geographer	225
	References	230
14	Conic Sections	231
14.1	The Parabola	235
14.2	The Ellipse	241
14.3	Hyperbola	243
	References	249
15	Apollonius of Perga	251
15.1	From Book III of the Conica	254
15.2	Apollonius' Theorem	258
15.3	The Touching Problem of Apollonius	260
15.4	The Theorem of Apollonius	261
	References	263
16	Beginnings of Trigonometry	265
16.1	Aristarchus of Samos	267
16.2	Hipparchus of Nicaea	270
16.3	Menelaus' Theorem	271
16.4	Applications in Geography	273
	Further References	277
17	Heron of Alexandria	279
17.1	From the Definitions	283
17.2	From Metrica and Geometrica	285
17.3	From the Stereometrica	291
17.4	Heron's Formula	293

17.5	Cube Doubling by Heron	296
17.6	Area of the Regular Pentagon	297
17.7	Root Calculation Among the Greeks	298
17.8	Other Works by Heron	301
	References	305
18	Claudius Ptolemy	307
18.1	Trigonometry in the <i>Almagest</i>	309
18.2	Ptolemy's Theorem	315
18.3	The Addition Theorem	316
18.4	Construction of the Pentagon According to Ptolemy	318
18.5	Construction of the 15-gon	320
18.6	The Geographical Work	320
	References	322
19	Nicomachus of Gerasa	325
19.1	From the <i>Arithmetica</i>	327
19.2	Proportions and Averages	330
19.3	The Nikomachos Theorem	332
19.4	From the Commentary of Lamblichos	334
	References	338
20	Theon of Smyrna	339
20.1	The Side or Diagonal Numbers	340
20.2	Geometric Interpretation	342
20.3	Number Theory	345
	References	346
21	Diophantus of Alexandria	347
21.1	From Diophantus' Book I and II	353
21.2	From Diophantus' Book III to V	357
21.3	From Diophantus' Book VI	361
21.4	From Diophantus' Books in Arabic	363
21.5	To the Mathematics of Diophantus'	366
21.6	Linear Diophantine Equation	370
21.7	Outlook	371
	Further References	375
22	Pappus of Alexandria	377
22.1	From Book VII of the <i>Collectio</i>	379
22.2	Pappos' Rule	380
22.3	Pappos' Touching Problem	382
22.4	Pappos' Theorem	383
22.5	The Complete Quadrilateral	385
22.6	Harmonic Division	386

22.7	The Four-Line Problem	387
22.8	More Problems of Pappos	389
	References.	393
23	Theon of Alexandria	395
23.1	Life and Work	395
23.2	Hypatia of Alexandria	396
	References.	399
24	Proclus Diadochus.	401
24.1	The Mathematician's Catalogue of Eudemus	403
24.2	More Important Quotes	405
	References.	406
25	Roman Mathematics.	407
25.1	Calculating with Roman Numerals	409
25.2	Mathematical Examples from Literature	416
25.3	The Roman school	421
25.4	The Role of Roman Surveyors.	423
25.5	From the Corpus Agrimensorum	427
	References.	442
26	The Legacy of Hellenistic Mathematics	443
26.1	Mathematics in Byzantium	443
26.2	Outlook on the Latin Early Middle Ages.	448
26.3	Greek legacy in Islam	456
	References.	459
	Literatur.	461