

10A Contents

Icons, Symbols, and Notation

Used in the Textbook.....	II
Foreword.....	III
Contents.....	IV
Introduction to the Program.....	X
1. Mission Impossible. 2. The Find.....	VI
3. Origins. 4. Purpose.....	VII
5. The Temple of Mathematics	VIII
6. Relationship with Mathematics	X
7. A Cultural Shift	XI
8. The Pillars of Mathematics	XII
8.1. Algebra.....	XII
8.2. The Missing Algebraic Link.....	XII
8.3. The Geometry Neverland.....	XIV
8.4. A Personal Lamentation, or ... Golden Geo-Days of My Childhood...	XV
8.5. Reality Check: Geo-Algebra in U.S.?	XVI
Math Curriculum at a Glance	XVI
8.6. Bridge from High School to College or... Cravings for Calculus	XVII
8.7. Structure of Algebra & Statistics Topics in 6 th - 10 th Grades.....	XVIII
8.8. Structure of Geometry & Applications Topics in 6 th - 10 th Grades.....	XIX
8.9. The Main Principles.....	XX
9. Differentiate and Scaffold	XX
9.1. Suggested Scaffolding	XXI
9.2. Examples of Scaffolding	XXVIII
9.3. What are Optional Topics?	XXVIII
9.4. Does Scaffolding Really Work? ...	XXVIII
10. The Value of a Teacher.....	XXIX
11. Can Schools Succeed w/ the Program? ...	XXXI
11.1. The U.S. Students.....	XXXI
11.2. Can Girls Succeed in Math?.....	XXXI
11.3. The Needed Cultural Shift	XXXII
11.4. Continuity of the Curriculum	XXXII
11.5. Local Support	XXXII
12. Within the Global U.S. Picture	XXXIII
13. How to Work with the 10A Materials	XXXIV
14. Biographical Sketches	XXXIV
15. Math Taught the Right Way	XXXVII
16. BMC Summer Program	XXXVII
17. Reviews by Educators and Parents ...	XXXVIII
18. Acknowledgments	XLII

Let the Math Begin!

Chapter 1. Initial Review

1. Review Test 1 with Solutions.....	2
2. Review Test 2 with Solutions.....	4
3. Review Test 3 with Solutions.....	6
4. Review Test 4 with Solutions.....	8
5A. Review Test 5 with Solutions.....	10
5B. Entrance Tests 1-2	11
6A. Entrance Tests 3-4	12
6B. Entrance Tests 5-6	13
7. How Mathematicians Write Solutions ..	14
8. How to Study for and to Take Tests	16

Chapter 2. Power and Logarithm



9. Third Root. Properties	18
10. n^{th} Root. Properties	22
11. Operating on Irrational Expressions	26
12. Working with Irrational Expressions. Exercises	30
13. Function. Graph of a Function. Review with Extensions.....	34
14. Graph of the Function $\sqrt{x}$	38
15. Graphs of the Functions x^3 and $\sqrt[3]{x}$	42
16. Power with an Integer Exponent. Review and Applications	46
17. Power with a Rational Exponent. Properties	50
18. Power with a Rational Exponent. Exercises	54
19. Power and Exponential Functions and Their Graphs	58
20. Logarithm. Basic Properties.....	62
21. Logarithm. Exercises on Domains.....	66
22. Logarithm. Comparing Logarithms	70
23. Logarithmic Function and Its Graph.....	74
24. Logarithm of a Product, Quotient, Power, and Root.....	78
25. Change of Logarithmic Base. Exercises.	82
26. Summary of “Power and Logarithm” ... General Problems.....	89
27. Tests 1-2 on “Power and Logarithm”	90

Chapter 3. Stereometry (3d Geometry)

28. Lines and Planes in Space. Relative Position of Two Lines and the Angle between Them.....	92
29. Relative Position of a Line and a Plane.....	96
30. Orthogonal Projections. Angle between a Line and a Plane	100
31. Relative Position of Two Planes. Angle between Two Planes	104
32. Right Prism Review with Extensions.....	108
33. Pyramid Review with Extensions.....	112
34. Pyramids with Equal Elements. Exercises	116
35. Right Circular Cylinder Review with Extensions.....	120
36. Right Circular Cone Review with Extensions.....	124
37. Sphere and Ball Review with Extensions.....	128
38. Summary of “Stereometry,” Part I Review with Extensions.....	132
Axiomatic Foundation $\times$ and $\parallel$ Lines and Planes Proofs vs. “Obvious facts” Angles. $\perp$ Lines and Planes Drawing 3d-Objects on Paper Realistically Properties of Any Projection	
39. Summary of “Stereometry,” Part II Review with Extensions.....	136
$\perp$ and $\parallel$ Lines and Planes Projection Area Formulas Orthogonal Transversal of Skew Lines Solids. Surface Areas and Volumes	
40. Summary of “Stereometry,” Part III Review with Extensions.....	140
Incircles and Circumcircles in the Plane Insphere and Circumsphere in Space General Problems.....	143
41. Tests 1-2 on “Stereometry”	144

Chapter 4. Algebra on Polynomials

42. Polynomials in One Variable. Equal Polynomials and Zeros (Review with Extensions).....	146
43. Operations on Polynomials. Polynomial “Long” Division	150
44. Rational Roots of an Equation with Rational Coefficients.....	154
45. Horner's Scheme, Part I Applications to Polynomials	158
46. Horner's Scheme, Part II Applications to Numerical Systems.....	162
47. Solving Some Types of Equations of Higher Degrees	166
48. Reciprocal Equations	170
49. Symmetric Polynomials of Two Variables, Part I.....	174
50. Symmetric Polynomials of the Roots of a Quadratic Equation, Part II	178
Generalization with Linear Combinations Fibonacci Numbers as Sym. Polynomials	
51. Summary and Extensions, Part I	182
Roots and Reciprocal Polynomials Factoring Mirror Polynomials General Problems, Part I.....	185
52. Summary and Extensions, Part II.....	186
Symmetry and Factorization Solving Homogeneous Equations Ultimate Factorization and Irreducibility General Problems, Part II.....	189
53. Summary and Extensions, Part III	190
Number Bases, Digits, and Divisibility Mini-Test with Solutions.....	192
Polynomials Everywhere!	193
General Problems, Part III	193
54. Tests 1-4 on “Algebra on Polynomials”	194

Answers.....XLIII

Chapter 1. Initial Review XLIII

Chapter 2. Powers and Logarithms..... XLIII

Chapter 3. Stereometry..... XLVIII

Chapter 4. Algebra on Polynomials L

10A Index: Concepts & Statements LIV