Table of Contents for Advanced Mathematics, Second Edition

Preface Lesson 1 Geometry Review Lesson 2 More on Area * Cylinders and Prisms * Cones and Pyramids * Spheres **Lesson 3** Pythagorean Theorem * Triangle Inequalities (1) * Similar Polygons * Similar Triangles Lesson 4 Construction Lesson 5 Exponents and Radicals * Complex Numbers * Areas of Similar Geometric Figures * Diagonals of Rectangular Solids Lesson 6 Fractional Equations * Radical Equations * Systems of Three Linear Equations Lesson 7 Inductive and Deductive Reasoning * Logic * The Contrapositive * Converse and Inverse Lesson 8 Statements of Similarity * Proportional Segments * Angle **Bisectors and Side Ratios** Lesson 9 Congruent Figures * Proof Outlines Lesson 10 Equation of a Line * Rational Denominators * Completing the Square Lesson 11 Circles * Properties of Circles * The Quadratic Formula Lesson 12 Angles and Diagonals in Polygons * Proof of the Chord-Tangent Theorem Lesson 13 Intersecting Secants * Intersecting Secants and Tangents * Products of Chord Segments * Products of Secant and Tangent Seaments Lesson 14 Sine, Cosine, and Tangent * Angles of Elevation and Depression * Rectangular and Polar Coordinates * Coordinate Conversion Lesson 15 Assumptions * Proofs Lesson 16 Complex Fractions * Abstract Equations * Division of Polynomials Lesson 17 Proofs of the Pythagorean Theorem * Proofs of Similarity Lesson 18 Advanced Word Problems Lesson 19 Nonlinear Systems * Factoring Exponentials * Sum and **Difference of Two Cubes** Lesson 20 Two Special Triangles Lesson 21 Evaluating Functions * Domain and Range * Types of Functions * Tests for Functions Lesson 22 Absolute Value * Reciprocal Functions Lesson 23 The Exponential Function * Sketching Exponentials Lesson 24 Sums of Trigonometric Functions * Combining Functions Lesson 25 Age Problems * Rate Problems Lesson 26 The Logarithmic Form of the Exponential * Logarithmic Equations Lesson 27 Related Angles * Signs of Trigonometric Functions Lesson 28 Factorial Notation * Abstract Rate Problems Lesson 29 The Unit Circle * Very Large and Very Small Fractions * **Quadrantal Angles** Lesson 30 Addition of Vectors * Overlapping Triangles Lesson 31 Symmetry * Reflections * Translations Lesson 32 Inverse Functions * Four Quadrant Signs * Inverse **Trigonometric Functions** Lesson 33 Quadrilaterals * Properties of Parallelograms * Types of Parallelograms * Conditions for Parallelograms * Trapezoids Lesson 34 Summation Notation * Linear Regression * Decomposing Functions Lesson 35 Change in Coordinates * The Name of a Number * The **Distance** Formula Lesson 36 Angles Greater Than 360°* Sums of Trigonometric Functions * Boat-in-the-River Problems Lesson 37 The Line as a Locus * The Midpoint Formula Lesson 38 Fundamental Counting Principle and Permutations * Designated Roots * Overall Average Rate Lesson 39 Radian Measure of Angles * Forms of Linear Equations Lesson 40 The Argument in Mathematics * The Laws of Logarithms * Properties of Inverse Functions

Lesson 41 Reciprocal Trigonometric Functions * Permutation Notation Lesson 42 Conic Sections * Circles * Constants in Exponential Functions Lesson 43 Periodic Functions * Graphs of Sin and Cos Lesson 44 Abstract Rate Problems Lesson 45 Conditional Permutations * Two-Variable Analysis Using a Graphing Calculator Lesson 46 Complex Roots * Factoring Over the Complex Numbers Lesson 47 Vertical Sinusoid Translations * Arctan Lesson 48 Powers of Trigonometric Functions * Perpendicular Bisectors Lesson 49 The Logarithmic Function * Development of the Rules for Logarithms Lesson 50 Trigonometric Equations Lesson 51 Common Logarithms and Natural Logarithms Lesson 52 The Inviolable Argument * Arguments in Trigonometric Equations Lesson 53 Review of Unit Multipliers * Angular Velocity Lesson 54 Parabolas **Lesson 55** Circular Permutations * Distinguishable Permutations Lesson 56 Triangular Areas * Areas of Segments * Systems of Inequalities Lesson 57 Phase Shifts in Sinusoids * Period of a Sinusoid Lesson 58 Distance from a Point to a Line * "Narrow" and "Wide" Parabolas Lesson 59 Advanced Logarithm Problems * The Color of the White House Lesson 60 Factorable Trigonometric Equations * Loss of Solutions Caused by Division Lesson 61 Single-Variable Analysis * The Normal Distribution * Boxand-Whisker Plots Lesson 62 Abstract Coefficients * Linear Variation Lesson 63 Circles and Completing the Square Lesson 64 The Complex Plane * Polar Form of a Complex Number * Sums and Products of Complex Numbers Lesson 65 Radicals in Trigonometric Equations * Graphs of Logarithmic Functions Lesson 66 Formulas for Systems of Equations * Phase Shifts and **Period Changes** Lesson 67 Antilogarithms Lesson 68 Locus Definition of a Parabola * Translated Parabolas * Applications * Derivation Lesson 69 Matrices * Determinants Lesson 70 Percentiles and z Scores Lesson 71 The Ellipse (1) Lesson 72 One Side Plus Two Other Parts * Law of Sines Lesson 73 Regular Polygons Lesson 74 Cramer's Rule Lesson 75 Combinations Lesson 76 Functions of (-x) * Functions of the Other Angle * Trigonometric Identities (1) * Rules of the Game **Lesson 77** Binomial Expansions (1) Lesson 78 The Hyperbola Lesson 79 De Moivre's Theorem * Roots of Complex Numbers Lesson 80 Trigonometric Identities (2) Lesson 81 Law of Cosines Lesson 82 Taking the Logarithm of * Exponential Equations Lesson 83 Simple Probability * Independent Events * Replacement Lesson 84 Factorable Expressions * Sketching Sinusoids Lesson 85 Advanced Trigonometric Equations * Clock Problems Lesson 86 Arithmetic Progressions and Arithmetic Means Lesson 87 Sum and Difference Identities * Tangent Identities **Lesson 88** Exponential Functions (Growth and Decay) Lesson 89 The Ellipse (2) Lesson 90 Double-Angle Identities * Half-Angle Identities Lesson 91 Geometric Progressions Lesson 92 Probability of Either * Notations for Permutations and Combinations Lesson 93 Advanced Trigonometric Identities * Triangle Inequalities (2)

Lesson 94 Graphs of Secant and Cosecant * Graphs of Tangent and Cotangent Lesson 95 Advanced Complex Roots Lesson 96 More Double-Angle Identities * Triangle Area Formula * Proof of the Law of Sines * Equal Angles Imply Proportional Sides Lesson 97 The Ambiguous Case Lesson 98 Change of Base * Contrived Logarithm Problems Lesson 99 Sequence Notations * Advanced Sequence Problems * The Arithmetic and Geometric Means Lesson 100 Product Identities * More Sum and Difference Identities Lesson 101 Zero Determinants * 3 x 3 Determinants * Determinant Solutions of 3 x 3 Systems * Independent Equations Lesson 102 Binomial Expansions (2) Lesson 103 Calculations with Logarithms * Power of the Hydrogen Lesson 104 Arithmetic Series * Geometric Series Lesson 105 Cofactors * Expansion by Cofactors Lesson 106 Translations of Conic Sections * Equations of the Ellipse * Equations of the Hyperbola Lesson 107 Convergent Geometric Series Lesson 108 Matrix Addition and Multiplication Lesson 109 Rational Numbers Lesson 110 Graphs of arcsine and arccosine * Graphs of arcsecant and arccosecant * Graphs of arctangent and arccotangent Lesson 111 Logarithmic Inequalities: Base Greater Than 1 * Logarithmic Inequalities: Base Less Than 1 Lesson 112 Binomial Theorem Lesson 113 Synthetic Division * Zeros and Roots Lesson 114 Graphs of Factored Polynomial Functions Lesson 115 The Remainder Theorem Lesson 116 The Region of Interest Lesson 117 Prime and Relatively Prime Numbers * Rational Roots Theorem Lesson 118 Roots of Polynomial Equations Lesson 119 Descartes' Rule of Signs * Upper and Lower Bound Theorem * Irrational Roots Lesson 120 Matrix Algebra * Finding Inverse Matrices Lesson 121 Piecewise Functions * Greatest Integer Function Lesson 122 Graphs of Rational Functions * Graphs that Contain Holes Lesson 123 The General Conic Equation Lesson 124 Point of Division Formulas Lesson 125 Using the Graphing Calculator to Graph * Solutions of Systems of Equations Using the Graphing Calculator * Roots Appendix Proofs Answers Index