**Overview for PFA Advanced Math**

**Semester 1**

In the first semester of Saxon Advanced Mathematics at Pioneer Family Academy, we complete in order lessons 1 through 69, skipping 4, along with the respective tests for those lessons. The book is written in a spiral review method. Covered in this semester are the following topics by lesson titles:

**Algebra, Math Analysis and Number Theory**

Exponents and Radicals, Complex Numbers, Fractional Equations, Radical Equations, Systems of Three Linear Equations, Equation of a Line, Rational Denominators, Completing the Square, The Quadratic Formula, Rectangular and Polar Coordinates, Coordinate Conversion, Assumptions, Proofs, Complex Fractions, Abstract Equations, Division of Polynomials, Advanced Word Problems, Nonlinear Systems, Factoring Exponentials, Sum and Difference of Two Cubes, Evaluating Functions, Domain and Range, Types of Functions, Tests for Functions, Absolute Value, Reciprocal Functions, The Exponential Function, Sketching Exponentials, Combining Functions, Age Problems, Rate Problems, The Logarithmic Form of the Exponential, Logarithmic Equations, Factorial Notation, Abstract Rate Problems, Very Large and Very Small Fractions, Inverse Functions, Summation Notation, Linear Regression, Decomposing Functions, Change in Coordinates, The Name of a Number, The Distance Formula, Boat in the River Problems, The Line as a Locus, The Midpoint Formula, Fundamental Counting Principle and Permutations, Designated Roots, Overall Average Rate, The Argument in Mathematics, The Laws of Logarithms, Properties of Inverse Functions, Permutation Notation, Conic Sections, Circles, Constants of Exponential Functions, Abstract Rate Problems, Conditional Permutations, Two-Variable Analysis Using a Graphing Calculator, Complex Roots, Factoring Over the Complex Numbers, The Logarithmic Function, Development of the Rules for Logarithms, Common Logarithms and Natural Logarithms, “Narrow” and “Wide” Parabolas, Distinguishable Permutations, Triangular Areas, Areas of Segments, Systems of Inequalities, Distance from a Point to a Line, Advanced Logarithm Problems, The Color of the White House, Loss of Solutions Caused by Division, Single-Variable Analysis, The Normal Distribution, Box and Whisker Plots, Abstract Coefficients, Linear Variation, Circles and Completing the Square, The Complex Plane, Polar Form of a Complex Number, Sums and Products of Complex Numbers, Graphs of Logarithmic Functions, Formulas for Systems of Equations, Antilogarithms, Locus Definition of a Parabola, Translated Parabolas, Applications and Derivation, Matrices, Determinants

**Geometry and Logic**

Geometry Review, 2D Area, 3D Surface Area and Volume, Pythagorean Theorem, Triangle Inequalities, Similar Polygons and Triangles, Areas of Similar Geometric Figures, Diagonals of Rectangular Solids, Inductive and Deductive Reasoning, Logic, The Contrapositive, Converse and Inverse, Statements of Similarity, Proportional Segments, Angle Bisectors and Side Ratios, Congruent Figures, Proof Outlines, Circles, Properties of Circles, Angles and Diagonals in Polygons, Proof of the Chord-Tangent Theorem, Intersecting Secants, Intersecting Secants and Tangents, Products of Chord Segments, Products of Secant and Tangent Segments, Proofs of the Pythagorean Theorem, Proofs of Similarity, Overlapping Triangles, Symmetry, Reflections, Translations, Quadrilaterals, Properties of Parallelograms, Types of Parallelograms, Conditions for Parallelograms, Trapezoids, Perpendicular Bisectors,

**Trigonometry**

Sine Cosine and Tangent, Angles of Elevation and Depression, Two Special Triangles, Sums of Trigonometric Functions, Related Angles, Signs of Trigonometric Functions, The Unit Circle, Quadrantal Angles, Addition of Vectors, Four Quadrant Signs, Inverse Trigonometric Functions, Angles Greater than 360, Sums of Trigonometric Functions, Radian Measure of Angles, Forms of Linear Equations, Reciprocal Trigonometric Functions, Periodic Functions, Graphs of Sin θ and Cos θ, Vertical Sinusoid Translations, Arctan, Powers of Trigonometric Functions, Trigonometric Equations, The Inviolable Argument, Arguments in Trigonometric Equations, Review of Unit Multipliers, Angular Velocity, Parabolas, Circular Permutations, Phase Shifts in Sinusoids, Period of a Sinusoid, Factorable Trigonometric Equations, Radicals in Trigonometric Equations, Phase Shifts and Period Changes.