

# Saxon *Advanced Mathematics* Scope and Sequence

<b>Foundations</b>
<b>Calculator</b>
Perform two-variable analysis
Use graphing calculators
Find roots of equations
Solve systems of equations
<b>Exponentials and Logarithms</b>
Factor exponentials
Solve exponential equations
Evaluate exponential functions
Understand and use logarithms
Convert logarithms to exponentials
Use logarithms in problems
Use the rules of logarithms
Evaluate logarithmic functions
Change bases
Use logarithms in calculations
Solve logarithmic inequalities
Find antilogarithms
Find common logarithms
Find natural logarithms
Graph logarithms
Evaluate logarithms
<b>Complex Numbers</b>
Understand and use complex numbers
Factor complex numbers
Graph complex numbers
Express complex numbers in polar form
Find sums and products of complex numbers
Rationalize denominators
Find complex roots of equations
<b>Equations and Inequalities</b>
<b>Equations and Inequalities</b>
Use the Pythagorean theorem and inequalities
Solve fractional equations
Solve radical equations
Solve abstract equations
Use designated roots to identify equations
Use synthetic division
Use the remainder theorem
Use the rational roots theorem
Find roots of polynomial equations
<b>Systems of Equations and Inequalities</b>
Solve systems of three equations
Use systems to solve application problems
Solve nonlinear systems
Solve systems of two inequalities
Use formulas to solve systems of equations

Use matrices to solve systems of equations
<b>Functions and Graphs</b>
<b>Functions</b>
Use function notation
Evaluate functions
Understand domain and range
Identify relations
Use function tests
Use absolute value functions
Graph reciprocal functions
Understand asymptotes
Understand function arguments
Find inverse functions
Use linear variation
Graph piecewise functions
Graph the greatest integer function
Graph rational functions
<b>Lines</b>
Write equations of lines
Use the distance formula
Understand lines as locuses
Write equation of a line equidistant from two points
Use the midpoint formula
Know forms of linear equations
Slope-intercept form
General form
Double-intercept form
Point-slope form
Two-point form
Find distances from points to lines
<b>Polynomials and Polynomial Functions</b>
Complete the square
Use the quadratic formula
Use abstract coefficients
Graph polynomial functions
Determine the region of interest
Use the rational roots theorem
Use Descartes' rule of signs
Find upper and lower bounds
Find irrational roots
<b>Conics</b>
Know the general conic sections
Circles
Parabolas
Ellipses
Hyperbolas
Translations
Complete the square to graph conic sections

<b>Geometry</b>
<b>Foundations of Geometry</b>
Know terms and definitions
Understand planes
Use tick marks
Define cylinder surfaces
Use scale factors
Find lengths of diagonals of rectangular solids
Understand similarity
Find lengths of proportional segments
Understand congruence
Use Euclid's ten postulates
Understand symmetry
Understand reflections
Understand translations
<b>Angles</b>
Understand angles
Understand parallel lines
Identify and use transversals
Identify alternate and corresponding angles
Use angle bisectors
Use angles greater than $360^\circ$
<b>Circles</b>
Find areas of circles and sectors
Know properties and parts of circles
Use intersecting secants and tangents
Use chord products
<b>Polygons</b>
Define convex and concave polygons
Identify similar polygons
Find the sum of the angles in a polygon
Identify quadrilaterals
Know the properties of parallelograms
Understand regular polygons
Work with triangles
Areas
Pythagorean theorem and inequalities
Similar triangles
Side ratios
Overlapping triangles
Solving for unknown lengths
Missing parts
The ambiguous case
Work with trapezoids
Areas
Properties of
<b>Plannar Area</b>
Find areas of rectangles
Find areas of sectors of circles
Find areas of triangles

Find areas of segments or circles
<b>Surface Area</b>
Find lateral surface areas
Find surface areas of cones
Find surface areas of spheres
<b>Volume</b>
Find volumes of cylinders and prisms
Find volumes of cones and pyramids
Find volumes of spheres
<b>Constructions</b>
Construct segments
Construct bisecting angles
Construct perpendiculars
Construct triangles
Construct parallel lines
<b>Sequences and Series</b>
Use the fundamental counting principle
Use binomial expansion
Work with arithmetic progressions
Find arithmetic means
Work with geometric means and progressions
Use sequence notation
Solve sequence problems
Find sums of arithmetic series
Find sums of geometric series
Convergent geometric series
Use the binomial theorem
<b>Matrices</b>
Find determinants
Use Cramer's rule
Understand independent equations
Use matrices to solve systems of equations
Use expansion by cofactors
Add matrices
Multiply matrices
Understand matrix algebra
Find inverse matrices
<b>Trigonometry</b>
<b>Functions and Graphs</b>
Evaluate in $45^\circ$ - $45^\circ$ - $90^\circ$
Evaluate in $30^\circ$ - $60^\circ$ - $90^\circ$
Evaluate sums of trigonometric functions
Determine signs of trigonometric functions
Find related angles
Use the unit circle
Use the four quadrantal angles
Know the signs in each quadrant
Know the reciprocal trigonometric functions
Know the inverse trigonometric functions
Use angles greater than $360^\circ$

Use radian measures of angles
Evaluate trigonometric functions in radians
Understand periodic functions (sinusoids)
Write equations of sinusoids
Graph trigonometric functions
Graph inverse trigonometric functions
Understand vertical sinusoidal translations
Evaluate powers of trigonometric functions
Find phase shifts of sinusoids
Find periods of sinusoids
Use De Moivre's theorem
Sketch sinusoids
<b>Identities and Inequalities</b>
Use the triangle inequality postulate
Define sine, cosine, and tangent
Solve problems with angles of elevation and depression
Convert rectangular to polar form/reverse
Add vectors using trigonometry
Solve trigonometric equations
Inviolable argument
Factorable trigonometric equations
Loss of solutions by division
Use the laws of sines
Simplify functions of $(-x)$
Simplify functions of "the other angle"
Prove trigonometric identities
Use the law of cosines
Know and use the sum and difference identities
Know and use the tangent identities
Know and use the double-angle identities
Know and use the half-angle identities
Know and use the product identities
<b>Applied Mathematics</b>
<b>Word Problems</b>
Solve number problems
Solve money problems
Solve variation problems
Solve digit problems
Solve mixture problems
Solve age problems
Solve rate problems
Solve abstract rate problems
Solve boat-in-the-river problems
Convert with unit multipliers
Solve angular velocity problems
Solve clock problems
<b>Statistics and Probability</b>
Use summation notation
Use linear regression
Use two-variable analysis

Use single-variable analysis
Understand the normal distribution
Draw box-and-whisker plots
Compute percentiles
Compute z scores
Compute permutations
Notation
Conditional permutations
Circular permutations
Distinguishable permutations
Compute combinations
Compute simple probability
Independent events
With replacement
Either of two events
<b>Proofs</b>
<b>Elements of Proofs</b>
Understand basic logic and reasoning
State the contrapositives of conditional statements
State the converses and inverses of conditional statements
Do proof outlines
Do formal proofs
<b>Theorems</b>
Prove the chord-tangent theorem
Prove theorems about secants and tangents
Prove theorems about chord products
Prove the Pythagorean theorem
Prove similarity of triangles
Prove the law of sines
Prove that equal angles imply proportional sides