Arithmetic
History of Arithmetic
Origin of Arithmetic Symbols
Whole Numbers
Round whole numbers
Operations with Whole Numbers
Add Whole Numbers
Subtract Whole Numbers
Multiply Whole Numbers
Divide Whole Numbers
Fractions
Add Fractions
Subtract Fractions
Multiply Fractions
Divide Fractions
Convert between mixed numbers and improper fractions
Decimal Numbers
Understand Decimal Numbers
Order Decimal Numbers on the Number Line
Round Decimal Numbers
Round Repeating Decimal Numbers
Convert Decimal Numbers to Fractions
Convert Decimal Numbers to Percents
Add And Subtract Decimal Numbers
Multiply And Divide Decimal Numbers
Understand and Use Scientific Notation
For Large And Small Numbers
With Addition Of Exponents
In Multiplication
In Division
In Approximating
On a Scientific Calculator
In Unit Conversions
In Ideal Gas Law Problems
Graphs (Analytical Geometry)
Descartes and Fermat and history of analytical geometry
Graphs of Data
Interpret and construct bar graphs
Interpret and construct broken line graphs
Interpret and construct pie graphs
Graphs on the Coordinate Plane
Define axes, coordinates, quadrants, and origin
Recognize and Plot Ordered Pairs
Use the Distance Formula
Graph Linear Equations
Equation Of A Line
By Substitution
To Solve Systems Of Equations
Finding Slopes
Slope Formula
y-Intercept
Vertical And Horizontal Lines
Parallel and Perpendicular Lines
Using Slope-Intercept Form
Given Two Ordered Pairs

Given Slope
Given Experimental Data
Find best-fit line using linear regression on calculator and/or computer
Use combinations of algebraic, tabular, graphical, or verbal descriptions of linear functions
Interpret situations in terms of given graphs or create situations that fit graphs
Consistent, Inconsistent, and Dependent
Graph Circles, Ellipses, Hyperbolas, and Parabolas
Identify graphic and symbolic forms of the following nonlinear functions: absolute value, quadratic, square root, exponential, cubic, reciprocal
Determine whether or not given situations can be represented by linear or nonlinear functions
Complex Plane
graphing a+bi
Graphing Inequalities
Inequalities on a number line
Absolute value
Quadratic
Linear and nonlinear inequalities
Systems of linear and nonlinear inequalities
Number Sets
History of Number
Other Numeral Systems, including binary (for computer math), Roman Numerals, Sexagesimal
Origin of Zero
Infinity
Infinitesimal
Sets
Use Set Notation
Distinguish Between Finite and Infinite
Understand Set Membership
Represent Subsets of the Real Numbers Symbolically
Represent Subsets of the Real Numbers Using Diagrams
Identify Subsets
Find intersection and unions of sets
Use Venn diagrams
Interval notation (open and closed)
Real Numbers
Classify the Real Numbers
Natural (Counting) Numbers and Whole Numbers
Integers, Rational Numbers, and Irrational Numbers
Order on a Number Line
Compute sums, products, differences, and quotients of decimal numbers
Perform operations with integers
Addition
Subtraction
Multiplication
Division
Symbols of Inclusion
Absolute Value
Identifying negative numbers
Opposites with multiple signs
Within order of operations
Parentheses
Parentheses,braces, and brackets
Understanding elementary number theory
Factors and Divisibility
Find least common multiples
Find reciprocals

Find greatest common factors
Understand inverse operations
Convert from base 2 to 10 and vice-versa
Know the properties of real numbers
Chart of properties
Commutative property of addition and multiplication
Associative property of Addition and Multiplication
Distributive Property
Additive Inverse
Multiplicative Inverse
Additive Identity
Multiplicative Identity
Of zero
Of -1
Of 1
Of equality
Additive Property
Of zero
Of equality
Complex Numbers
Euler's notation for i = square root of -1
Use the standard form for a complex number
Understand imaginary numbers
Add complex numbers
Multiply complex numbers
Divide complex numbers
Multiply complex conjugates
Find complex roots of quadratic equations
Measurement
The Lord abhors dishonest weights and measures(Deuteronomy 25:16, Proverbs 20:23, etc.)
English Measurement
Know U.S. Customary units of length and volume
Metric Measurement
Know the metric units of length and volume
Conversion by Unit Multipliers
Convert within English system
in./ft, ft/yd, ft/mi
Multiple unit multipliers
Volume
Area
Rate
Convert within metric system
cm/m, km/m
Multiple unit multipliers
Area
Volume
Convert between english and metric units
Length
Area
Volume
Rate conversions with 2 unit multipliers
Foreign Currency Conversion
Convert US to foreign and vice-versa
Convert foreign to foreign using 2 unit multipliers
Ratio, Proportion, Percent, and Rate
History of Ratio

Define ratio
Connect idea of ratio to rational, logos, and other areas like language, unity and diversity
Greek's discovery of square root of 2 and problems they had
History of pi, golden ratio, etc.
Ratio
Solve ratio word problems
Express Rates as ratios
Compare unit prices
Solve Rate Problems
Solve advanced ratio problems involving totals
Use the ideal gas law(PV=nRT, PV/T = k)
Proportion
Cross multiply to solve proportions
Use scale factors on geometric shapes
Solve similar triangles for missing sides
Use proportions with chemical compounds
Percent
Find percents of numbers
fraction/decimal/percent conversion
Use the percent equation
Solve percent word problems
Use percents in chemical weight problems
Visualize percents using diagrams
Use percents greater than one hundred
Solve percent increase/decrease problems
Rate
Change rates using multipliers
Solve uniform motion problems
Solve boat in the river problems
Exponents
Know order of operations with exponents
Evaluate expressions with exponents
Simplify powers of fractions
Simplify powers of signed numbers
Know the product theorem for exponents
Evaluate powers of negative bases
Use negative exponents
Solve equations with exponents
Use zero as an exponent
Know the quotient rule for exponents
Know the power theorem for exponents
Use the exponent calculator key
Understand exponential increase and decrease
Understand and use fractional exponents
Roots
Find square roots, cube roots, and fourth roots
Know order of operations with roots
Evaluate expressions with roots
Take root of negative numbers
Know the product of square roots rule
Add radical expressions
Multiply radical expressions
Find roots of large numbers
Solve radical equations
Know the quotient theorem for roots
Rationalize denominators

Simplify roots of roots
Convert roots to fractional exponents
Use Euler's notation
Evaluate roots with a scientific calculator
Statistics and Probability
Probability
Use counting techniques to compute probability
Simple Probability
Independent events
Product of probabilities
Fundamental counting principle
Permutations
Combinations
Statistics
Use and construct stem-and-leaf plots
Use and construct histograms
Compute measures of central tendency
Understand normal curves
Understand standard deviation
Linear regressions on calculator/computer
Using Punnett Squares
Using Hardy-Weinberg equation
Using Chi Square
Algebraic Expressions
Simplifying expressions
Combine like terms
Simple
With exponents
With negative exponents
Simplify exponential expressions
With exponentials and radicals/powers rule
With fractional exponents
With variable exponents
With signed numbers
Explanation
Evaluation with signed numbers
Multiplication and division
With negative signs/positive or negative exponents
Distributive property and negative exponents
Evaluate expressions with substitution
For variables
With symbols of inclusion
With signed numbers
With signed numbers and symbols of inclusion
Simplifying expressions using
Distributive property
Order of operations
With fractions
With symbols of inclusion
Reduce expressions by common factor
Find the least common multiple of expressions
Find the greatest common factor of expressions
Simplify radical expressions
Addition
Multiplication
Using conjugates

Fractional exponents
Simplify Polynomial expressions
Monomials
Binomials
Difference of two squares
Sum and difference of two cubes
Trinomials
Simple factoring
Common factors
Common factor sums
Lead coefficients greater than one
Degrees of polynomials
Addition of polynomials
Multiplication of Polynomials
Division of Polynomials
Simple
Missing term in dividend
With two variables
Factoring by grouping
Expanding Polynomials
Simplify rational expressions
Multiplication
Addition
Factoring
Before multiplication
Before addition
Division
Denominators
Factoring
Rationalizing
By multiplication by radical
Using conjugates
Simplify complex fractions
Denominator-numerator same-quantity rule
Multiplicative property of equality
Additive property of equality
Advanced
Simplify complex numbers
Addition of like terms
Euler's notation
Using conjugate of the denominator
Multiple step
Multiplication
Division
Algebraic Equations
History of Algebra
Define algebra, etymology
Sawyer's "bag of rocks" idea to bridge algebra and arithmetic
Simplifying and solving equations
Define equations and basic rules
Simple
Conditional
Equivalent
Addition and Subtraction rules
Multiplication and Division rules
Use the fractional-part-of-a-number equation

Solve abstract equations
Use the decimal-part-of-a-number equation
Solve equations with mixed numbers
Solve equations using least common multiple
Use the percent equation
Solve multiple-step equations
Using two rules
Format
Variables on each side of equals sign
Two-step
Multiple terms
Multivariable abstract
Advanced
Euler word problems
Solve equations that have negative coefficients
Solve equations that have symbols of inclusion
Solve equations using distributive property
Translate word phrases into algebraic expressions
Translate word sentences into algebraic expressions
Solving equations involving variation
Direct and inverse variation
Squared
As ratio
Joint and combined
Solve rational equations
Solve radical equations
Linear Equations
Find linear equations to fit experimental data
Find equations of lines
Using slope intercept form
Given two points
Parallel to given lines
With given slopes
Finding slopes
Perpendicular to given lines
Horizontal and vertical lines
Slope formula
Distance Formula
Graph linear equations
Simple
Rearranging before graphing
For solution
Slope-intercept method
Solve two equations in two unknowns (systems of equations)
Substituting
For variable
One variable for another variable
Advanced
Rearranging before substitution
Subscripted variables
With fractions and decimal numbers
Using linear combination (elimination)
With angular relationship
Elimination of a variable
Subscripted variables
With fractions and decimal numbers

By graphing
Simple
With fractions and decimal numbers
Consistent, inconsistent, and dependant equations
Solve three equations and three unknowns
Nonstandard solutions to systems of equations
Quadratic Equations
Solve by factoring
Use difference of two squares theorem
Complete the square
Use the quadratic formula
Identify lead coefficients
Use discriminants
Nonstandard solutions to quadratic equations
Other types of Equations
Solve logarithmic equations
Solve exponential equations
Solve exponential growth problems
Find compound interest with calculator
Find roots of equations
Lead coefficients and completing the square
Complex roots
Using quadratic formula
Irrational roots
Discriminants
Solve equations with applications
Simple and compound interest
Markup and markdown
Coin problems
Chemical mixture problems
Age problems
Euler word problems
Explore nonlinear equations
Circles and ellipses
Parabolas
Hyperbolas
Solve systems of equations
Using elimination and substitution
By completing the square
Algebraic Skills (Functions)
Understanding functions
Define domain, range, independent variable, and dependent variable
Find domain and range from graphs of functions
Find domain and range from symbolic forms of functions
Use function notation
Interpret and makes inferences from functional relationships
Use the vertical line test (function or relation)
Represent functions as ordered pairs
Manipulating and Evaluating Functions
Multiply functions
Add functions
Graph and evaluate exponential functions
Evaluate trigonometric functions
Graphically
Numerically
Symbolically

Verbally
Describe functional relationships for given problem situations and write equations or inequalities to answer questions arising from the situations
Operations with functions (addition, subtraction, multiplication, division)
Inverse functions
Find symbolic form of inverse of a function
Identify a function and its inverse by their graphs
Composite functions
Evaluate functions
Graph and evaluate exponential functions
Evaluate trig functions
Nonstandard evaluations using symbols like *, #,
Evaluating Scientific Formulas
Ideal Gas Law
Evaluate a variety of scientific formulas
Trigonometry and Logarithms
Trigonometry
Define and use sine, cosine, and tangent
Evaluate trigonometric and inverse trigonometric functions with a scientific calculator
Solve right triangles
Define vectors
Use Parallelogram Law to sketch location of resultant vectors
Addition of vectors (resultant)
Negative vectors
Force vectors (resultant)
Periodicity
Modeling graphic, numeric and symbolic forms of sine and cosine
Unit Circle
Logarithms
Logarithm means exponent
Solve simple logarithmic equations
Find logarithms with a scientific calculator
Find antilogarithms with a scientific calculator
Know the laws of logarithms
Geometry
History of Geometry
Euclid and axioms, postulates, deductive reasoning
Aristotle, logic
Syllogisms
Hypotheses, Conclusions, and Counterexamples
Deductive Reasoning and Proof
Define and compare deductive and inductive reasoning
Euclid, axioms and postulates
Euclid, theorems(propositions) and proofs
Concept of proof and proof technique
Use of proof in various professions
Triangle Congruency
Triangle proofs
Prove theorems about lines
Prove theorems about angles
Prove theorems about circles
Prove theorems about parallelograms
Prove theorems about rhombuses
Prove theorems about trapezoids
Truth Tables
conjunctions and disjunctions

implications and negations
necessary and sufficient conditions
Construction
Construct and justify statements about geometric figures and their properties
Use construction to prove Euclid's Propositions I - V (Book 1)
Copy angles
Copy line segments
Construct perpendicular bisectors
Construct angle bisectors
Construct triangles and rectangles
Lines, points, segments, and planes
Identify lines
Intersecting
Parallel
Identify points and find distances between points
Identify segments
Characteristics
Identify planes and planes in space
Angles
Identify vertices of angles
Identify kinds of angles
Right, acute, straight, and obtuse angles
Complementary and supplementary angles
Adjacent angles
Vertical angles
Reflex angles
Corresponding interior and exterior angles
Alternate interior and exterior angles
Remote interior angles
Use inscribed angles
Find the sum of the angles in a polygon
Use angles with vectors
To find rectangular coordinates
To change from rectangular to polar form
Addition
Negative
Force at a point
Polygons
Classify polygons
Convex and concave
Equilateral and equiangular
By number of sides
Triangles
Quadrilaterals
Inscribed
Squares
Trapezoids
Trapezium
Parallelograms
Rhombuses
Rectangles
Pentagons
Hexagons
Understand regularity of polygons
Understand regularity of polygons
Translate, rotate, and reflect polygons

Identify vertices of polygons
Draw diagonals of polygons
Circles
Identify parts of circles
Radii and diameters
Chords
Arcs, sectors and central angles
Secants and tangents
Draw circumscribed and inscribed circles
Use degree measures
Convert between radians and degrees
Triangles
Classify triangles
Right, obtuse, acute, scalene, isosceles, and equilateral
30-60-90
45-45-90
Find measures of angles
Solve similar triangle problems
Two triangles
Overlapping triangles
Application to find height of tree, length of unknown, etc.
Geometric Solids
Identify cylinders and prisms
Identify circular and right circular cones
Identify rectangular and square pyramids
Identify spheres
Perimeter and Circumference
Compute perimeters of shapes
Define π
Compute circumferences
Circles
Semicircles
Area
Find areas of polygons
Rectangles and squares
Triangles
Parallelograms and trapezoids
Find areas of complex shapes
Made of two or more polygons
Made of polygons and semicircles
As differences (area of shaded region)
Find areas of circles, sectors, and semicircles
Surface Area and Volume
Find surface areas of geometric solids
Right circular cylinders
Triangular prisms and rectangular pyramids
Circular cones
Spheres
Complex shapes as the base
Find volumes of geometric solids
Right cylinders and prisms
Complex shapes as the base
Cones, pyramids, and spheres
Volumes with holes (pipes, hex nuts)
Find mass by converting a volume using density as conversion factor
Pythagorean Theorem

Find side lengths
Graph points to find distance
Pythagorean triples
Prove the Pythagorean Theorem
Geometry in art and architecture
Identify one point perspective in famous paintings and locate vanishing point
Create one point perspective drawing
Identify top, front, side view of architectural drawing
Make a net (two-dimensional model) of the surface area of a solid
Transformations
Nonstandard solutions to perimeter/area/volume geometry formulas
Calculus Fundamentals
History of Calculus, Newton, Leibniz, definition
Infinity
Infinitesimal, Bernoulli, Euler
Limits
Limits of discontinuous functions, approaching from left or right
Undefined limits
Limits of continuous functions
Limit as x approaches infinity
Derivatives
Derivative means slope
Derivative of simple polynomials like f(x) = x^2
Limit defintion of a derivative
Special limits like derivative of x^n, ln x, sin x
Applications involving derivative of x^n
Integrals
Summing area under a speed vs. time graph to find distance
Using upper rectangles to estimate area under a simple polynomial function
Using inscribed regular polygons to describe limit definition of an integral
Definite integrals for x^1 and x^2
Ratios as Rates