North Carolina
Standard Course of Study
Mathematics (1992–1993)

Subject: Grade 6

Goal 1: The learner will demonstrate an understanding and use of rational numbers.

1.1: Use models to relate percents to fractions and decimals; record, read and explain.

1.2: Use models and pictures to demonstrate ratios, proportions and percents; explain relationships.

1.3: Read, write and use numbers in various forms, including fractions, decimals, percents and exponential notation, choosing the appropriate form for a given task.

1.4: Find the prime factorization of a number less than 100.

1.5: Use prime factorization to investigate common factors and common multiples, using a calculator when appropriate.

1.6: Explore relationships among whole numbers, fractions, decimals and percents, using money, concrete models or a calculator.

1.7: Explore other numeration systems, including ancient number systems and alternate bases.

1.8: Explore the meaning of integers in real life situations.

Goal 2: The learner will demonstrate an understanding and use properties and relationships of geometry.

2.1: Build models of 3-dimensional figures (prisms, pyramids, cones and other solids); describe and record their properties.

2.2: Recognize and use angles (interior, exterior, complementary, supplementary) and pairs of lines, including skew lines.

2.3: Construct congruent segments and congruent angles. Construct bisectors of line segments, using a straight edge and compass.

2.4: Identify and distinguish among similar, congruent and symmetrical figures; name corresponding parts.

2.5: Recognize the results of translations, reflections and rotations using technology when appropriate.

2.6: Explore changes in a shape through stretching, shrinking and twisting.

2.7: Recognize geometry in the environment (e.g. art, nature, architecture).

Goal 3: The learner will demonstrate an understanding of patterns, relationships and pre-algebra.

3.1: Represent number patterns in a variety of ways, including the use of calculators and computers.

3.2: Use patterns to explore the rules for divisibility.

3.3: Use graphs and tables to represent relations of ordered pairs, using a calculator or a computer where appropriate; describe the relationships.

3.4: Identify and use patterning as a strategy to solve problems.

3.5: Use realistic examples or models to represent concepts and properties of variables, expressions and equations. (Identity property of zero, Identity property of one.)

3.6: Use the order of operations to simplify numerical expressions, verifying the results with a calculator or computer.

Goal 4: The learner will demonstrate an understanding and use of measurement.

4.1: Convert measures of length, area, volume, capacity and weight expressed in a given unit to other units in the same measurement system.

4.2: Determine whether a given measurement is precise enough for the specific situation; determine when estimates are sufficient for the measurement situation.

4.3: Explore the relationship of areas of triangles with the same base and height. Use models to demonstrate formulas for finding areas of triangles, parallelograms and circles.

4.4: Explore the effect on area and perimeter when changing one or two of the dimensions of a rectangle.

4.5: Use models, develop the concept of volume for rectangular solids as the product of the area of the base and the height.

4.6: Estimate solutions and solve problems related to volumes of rectangular solids.

Goal 5: The learner will solve problems and reason mathematically.

    5.1: Use an organized approach to solve non-routine and increasingly complex problems involving numeration, geometry, pre-algebra, measurement, graphing, computation, probability and statistics.

    5.2: Analyze problem situations and apply appropriate strategies for solving them.

    5.3: Use inductive and deductive reasoning to solve problems.

    5.4: Select an appropriate method for solving problems including estimation, observation, formulas, mental math, paper and pencil calculation, calculators and computers.

    5.5: Make conjectures and arguments and identify various points of view.

Goal 6: The learner will demonstrate an understanding and use of graphing, probability and statistics.

    6.1: Create and evaluate graphic representations of data including circle graphs.

    6.2: Use measures of central tendency (mean, median and mode) and range to describe meaningful data; compare two sets of unequal data.

    6.3: Display data using computer software and explore the use of spreadsheets.

    6.4: In the coordinate plane, locate ordered pairs in meaningful situations, using whole numbers, fractions and decimals.

    6.5: Estimate the likelihood of certain events from experiments with graphical data.

    6.6: Interpret a statistical statement and discuss the extent to which the results of a sample can be generalized.

    6.7: Find probabilities of simple events and discuss the implications.

    6.8: Design an experiment to test a theoretical probability; record and explain results.

Goal 7: The learner will compute with rational numbers.

    7.1: Use whole number operations to solve real world applications, demonstrating competence with and without calculators (multiplication and division up to 3 digits by 2 digits).

    7.2: Select appropriate strategies to solve a variety of application problems and justify the selection.

    7.3: Divide decimal numbers, record results and explain procedures, (1- and 2-digit divisors).

    7.4: Within a context, estimate results and apply appropriate operations with decimals.

    7.5: Use models and pictures to demonstrate multiplication and division of fractions and mixed numbers; record and explain results.

    7.6: Within a meaningful context, use estimation and operations with fractions less than one.

    7.7: In problem situations, use estimation and operations with fractions and mixed numbers.

    7.8: In meaningful contexts develop the concept of adding and subtracting integers; record results.

    7.9: Translate word problems into number sentences that use integers.

   7.10: Estimate percents in real world situations and justify the estimate.

   7.11: Use mental math to solve problems involving simple fractions, decimals and percents.

   7.12: Relate common fractions to frequently used percents; estimate and calculate using these percents (multiples of 10, 25, $33\frac{1}{3}$, $66\frac{2}{3}$, 75).

   7.13: Use ratios and proportions to explore probability and other interesting problems; discuss reasonableness of results.

Subject: Grade 7

Goal 1: The learner will demonstrate an understanding and use of real numbers.

    1.1: Use models to represent positive and negative rational numbers.

    1.2: Compare and order rational numbers in meaningful contexts.

    1.3: Express whole numbers in scientific notation; convert scientific notation to standard form; explore the use of scientific notation.

    1.4: Use exponential notation to express prime factorization of numbers less than 100.

    1.5: Within meaningful contexts use estimation techniques with rational numbers; justify the strategy chosen.

    1.6: Use geometric models to develop the meaning of the square and the positive square root of a number; estimate square roots and find square roots on the calculator.

    1.7: In meaningful contexts, relate concepts of ratio, proportion and percent.

Goal 2: **The learner will demonstrate an understanding and use properties and relationships of geometry.**

  2.1: Make constructions of perpendicular and parallel lines using a straight edge and compass.

  2.2: Use the concepts and relationships of geometry to solve problems.

  2.3: Use models to develop the concept of the Pythagorean Theorem.

  2.4: Identify applications of geometry in the environment.

  2.5: Given models of 3-dimensional figures, draw representations.

  2.6: Given the end, side, and top views of 3-dimensional figures, build models.

  2.7: On a coordinate plane, graph shapes and congruent figures.

Goal 3: **The learner will demonstrate an understanding of pre-algebra.**

  3.1: Describe, extend, analyze and create a wide variety of patterns to investigate relationships and solve problems.

  3.2: Use concrete materials as models to develop the concept of operations with variables.

  3.3: Use concrete, informal and formal methods to model and solve simple equations.

  3.4: Investigate and evaluate algebraic expressions using mental calculations, pencil and paper and calculators where appropriate.

  3.5: Given a simple equation, formulate a problem; solve and explain.

Goal 4: **The learner will demonstrate an understanding and use of measurement.**

  4.1: Apply measurement concepts and skills as needed in problem-solving situations.

  4.2: Make judgments about degree of precision needed and reasonableness of results in measurement situations.

  4.3: Use models to develop the concept and formula for surface area of rectangular solids and cylinders.

  4.4: Use models to develop the concept of volume for prisms/cylinders as the product of area of the base and height.

  4.5: Use models to explore the relationship of the volume of a cone to a cylinder and a pyramid to a prism with the same base and height.

  4.6: Estimate answers; then solve problems related to volume.

Goal 5: **The learner will solve problems and reason mathematically.**

  5.1: Use an organized approach and a variety of strategies to solve increasingly complex, non-routine problems.

  5.2: Use calculators and computers in problem-solving situations as appropriate.

  5.3: Discuss alternate strategies, evaluate outcomes and make conjectures and generalizations based on problem situations.

  5.4: Use concrete or pictorial models involving spatial visualization to solve problems.

  5.5: Identify and solve problems that require proportional reasoning.

  5.6: Solve problems involving interpretation of graphs, including inferences and conjectures.

Goal 6: **The learner will demonstrate an understanding and use of graphing, probability and statistics.**

  6.1: Create, compare and evaluate, both orally and in writing, different graphic representations of the same data.

  6.2: Construct a box plot (box-and-whisker) by ordering data, identifying the median, quartiles and extremes.

  6.3: Evaluate appropriate uses of different measures of central tendency.

  6.4: Draw inferences and construct convincing arguments based on analysis of data.

  6.5: Investigate and recognize misuses of statistical or numerical information.

  6.6: Show all possible outcomes by making lists, tree diagrams and frequency distribution tables.

  6.7: Explain the relationship between experimental results and mathematical expectations.

  6.8: Find the probability of simple events using experiments, random number generation, computer simulation and theoretical methods.

  6.9: Explore permutations and combinations in applications.

Goal 7: The learner will compute with real numbers.

7.1: Select appropriate operations, strategies and methods of solving a variety of application problems using positive rational numbers; justify the selection.

7.2: Estimate and solve problems using ratio, proportion and percent; select and use appropriate methods; explain the process used.

7.3: Apply concepts of ratio, proportion and percent to real life situations such as consumer applications, science and social studies.

7.4: Use real world examples and models to represent multiplication and division of integers; record and explain procedures used.

7.5: Use operations with integers in relevant problem situations.

Subject: Grade 8

Goal 1: The learner will demonstrate an understanding and use of real numbers.

1.1: Explore the real number system by describing and using various forms of numbers in realistic situations.

1.2: Use appropriate estimation techniques in meaningful situations; justify the technique.

1.3: Use and explain definitions and laws of exponents to write expressions in equivalent forms.

1.4: Use scientific notation to express whole numbers and numbers less than one, using a calculator when appropriate.

1.5: Investigate irrational numbers and their representations on a calculator as they arise from problem situations.

1.6: Describe the properties of terminating, repeating and nonrepeating decimals and be able to convert fractions to decimals and decimals to fractions.

1.7: Explore the absolute value of a number using the number line.

Goal 2: The learner will demonstrate an understanding and use properties and relationships of geometry.

2.1: Use the Pythagorean Theorem to find the missing side of a right triangle; use a calculator when appropriate.

2.2: Solve problems related to similar figures, using indirect measures to determine missing data.

2.3: Draw 3-dimensional figures from different perspectives (top, side, front).

2.4: On a coordinate plane, graph similar figures, reflections and translations.

2.5: Explore the triangle congruency relationships: ASA, SSS, SAS.

2.6: Explore the relationships of the angles formed when parallel lines are cut by a transversal.

2.7: Solve problems that relate geometric concepts to real world situations.

Goal 3: The learner will demonstrate an understanding of pre-algebra.

3.1: Describe, extend, analyze and create a wide variety of geometric and numerical patterns, such as Pascal's triangle or the Fibonacci sequence.

3.2: Identify and define the commutative, associative and distributive properties; give examples and explain their meanings.

3.3: Analyze representations of data with tables, graphs, verbal rules and equations to explore properties and relationships.

3.4: Using patterns and algebraic methods, solve problems, including those with integers.

3.5: Generate ordered pairs with and without a calculator and graph the linear equation.

3.6: Informally investigate non-linear equations and inequalities.

3.7: Given a formula, make appropriate substitutions and solve for one unknown.

Goal 4: The learner will demonstrate an understanding and use of measurement.

4.1: Estimate the answer, then solve complex problems that include applications of measurement; determine precision and check for reasonableness of results.

4.2: Determine the number of significant digits and the greatest possible error in measurement situations.

4.3: Select an appropriate unit and tool to find a measurement based upon the degree of accuracy required and the nature of the problem situation.

4.4: Find the surface area and volume of pyramids, prisms, cylinders and cones, with and without models.

4.5: Explore the effect on plane and solid figures when a dimension of the figure is changed.

Goal 5: The learner will solve problems and reason mathematically.

    5.1: Use an organized approach and a variety of strategies to solve increasingly complex non-routine problems.

    5.2: Use calculators and computers in problem-solving situations as appropriate.

    5.3: Make and evaluate conjectures and arguments, using deductive and inductive reasoning.

    5.4: Investigate open-ended problems, formulate questions and extend problem-solving situations.

    5.5: Represent situations verbally, numerically, graphically, geometrically and symbolically.

    5.6: Use ratio and proportion to solve problems.

Goal 6: The learner will demonstrate an understanding and use of graphing, probability and statistics.

    6.1: Collect data involving two variables and display on a scatter plot; interpret results.

    6.2: Compute the mean, interpret it, explain its sensitivity to extremes and explain its use in comparison with the median.

    6.3: Apply knowledge of statistics in problem-solving situations, selecting an appropriate format for presenting data.

    6.4: Use mathematical probabilities and experimental results to make predictions and decisions.

    6.5: Evaluate arguments based on data and investigate reasons why an inference made from a set of data can be invalid (biased or unbiased).

    6.6: Find the probability of simple and compound events using experiments, computer simulations, random number generation and theoretical methods.

Goal 7: The learner will compute with real numbers.

    7.1: Select appropriate operations, strategies and methods of solving a variety of application problems using real numbers; justify the selection.

    7.2: In meaningful contexts, develop the laws of exponents; solve problems involving exponentiation.

Subject: Pre-Algebra

Goal 1: **The learner will demonstrate an understanding of and use real numbers to solve problems.**

1.1: Read, write, and use numbers in various forms, including fractions, decimals, percents, and exponential notation.

1.2: Write numbers in scientific notation, using a calculator when appropriate.

1.3: Use patterns to explore the tests for divisibility.

1.4: Use exponential notation to express the prime factorization of a number.

1.5: Find the greatest common factor (GCF) and the least common multiple (LCM) of two or more numbers.

1.6: Compare two or more rational numbers.

1.7: Estimate sums, differences, products, and quotients of real numbers.

1.8: Use a table of squares or a calculator to find the square root of a number.

1.9: Estimate the square root of a number.

1.10: Demonstrate an understanding of the relationships between fractions, decimals, percents, and ratios.

1.11: Relate common fractions to frequently used percents; estimate and calculate using these percents.

1.12: Find the missing term of a proportion.

1.13: Find the percent of a given number.

1.14: Find what percent one number is of another.

1.15: Find a number when a percent of it is given.

1.16: Write fractions as equivalent, terminating, or repeating decimals.

1.17: Write terminating or repeating decimals as equivalent fractions.

1.18: Find the absolute value of a real number.

1.19: Use laws of exponents to write expressions in equivalent forms.

Goal 2: **The learner will demonstrate an understanding and use properties and relationships of geometry.**

2.1: Classify angles (interior, exterior, vertical, complementary, supplementary) and pairs of lines (parallel, perpendicular, skew) and solve problems involving them.

2.2: Identify and distinguish among similar, congruent, and symmetric figures; name corresponding parts.

2.3: Find the lengths of the sides of similar figures.

2.4: Use the Pythagorean Theorem to find the missing side of a right triangle and use a table of square roots, calculator or mental math to approximate square roots.

2.5: Find the lengths of the missing sides of $30°$-$60°$-$90°$ and $45°$-$45°$-$90°$ right triangles given the length of one side.

2.6: Graph similar geometric figures on a coordinate plane.

2.7: Solve problems that relate geometric concepts to real world situations.

Goal 3: **The learner will demonstrate an understanding of the language of algebra.**

3.1: Use order of operations to simplify numerical expressions, verifying the results with a calculator or computer.

3.2: Identify and use the commutative, associative, and distributive properties.

3.3: Evaluate algebraic expressions.

3.4: Solve simple equations algebraically.

3.5: Solve simple inequalities and graph their solutions.

3.6: Use graphs and tables to represent relations and functions of ordered pairs.

3.7: Describe, extend, analyze and create a variety of geometric and numerical patterns to investigate relationships and solve problems.

3.8: Given an equation, formulate a problem.

3.9: Write an equation which could be used to solve a given problem.

3.10: Given a rule or function that describes a linear equation, generate ordered pairs and graph the equation.

3.11: Given a formula, make appropriate substitutions and solve for one unknown.

Goal 4: The learner will demonstrate an understanding and use of measurement.

4.1: Apply measurement concepts and skills involving area, perimeter, and circumference in problem-solving situations.

4.2: Determine the effect on area and perimeter when changing one or two of the dimensions of a rectangle.

4.3: Find the surface area of rectangular solids, pyramids, cones and cylinders.

4.4: Find the volume of prisms, pyramids, cylinders and cones.

4.5: Estimate solutions and solve problems related to volumes of rectangular solids.

Goal 5: The learner will solve problems and reason mathematically.

5.1: Represent situations verbally, numerically, graphically, geometrically, or symbolically and use a variety of strategies to solve non-routine problems.

5.2: Discuss alternate strategies, evaluate outcomes, and make conjectures and generalizations based on problem situations.

5.3: Use concrete or pictoral models to solve problems.

5.4: Solve problems involving the interpretation of graphs including inferences and conjectures.

5.5: Make and evaluate conjectures and arguments, using deductive and inductive reasoning.

5.6: Investigate open-ended problems, formulate questions, and extend problem-solving situations.

5.7: Use proportional reasoning to solve problems.

Goal 6: The learner will demonstrate an understanding and use of probability and statistics.

6.1: Create, compare, and evaluate different graphic representations of the same data.

6.2: Use measures of central tendency (mean, mode, and median) and range to describe meaningful data; compare two sets of unequal data.

6.3: Evaluate appropriate uses of different measures of central tendency in problem-solving situations.

6.4: Draw inferences and construct convincing arguments based on an analysis of data.

6.5: Investigate and recognize misuses of statistical or numerical data.

6.6: Find the mathematical and experimental probability of simple and compound events using experiments, random number generation, computer simulation, and theoretical methods.

6.7: Collect data involving two variables and display them on a scatter plot.

6.8: Interpret data displayed on a scatter plot.

6.9: Use mathematical probability and experimental results for making predictions and decisions.

Goal 7: The learner will use fractions, decimals, percents, and integers to solve problems.

7.1: Use operations with whole numbers, decimals, fractions and integers to solve problems demonstrating appropriate use of mental math, computation, and calculators.

7.2: Select appropriate operations and strategies for solving a variety of applied problems involving fractions, decimals, and percents and justify the selection, using calculators, mental math, and estimates.

7.3: Estimate the answer to and solve problems using ratio, proportion, and percent.

7.4: Use ratio, proportion, and percent to solve real-world problems.

Subject: Algebra I-A

Goal 1: The learner will use the language of algebra.

1.1: Simplify numerical expressions.

1.2: Use "order of operations" to simplify numerical expressions.

1.3: Use grouping symbols to indicate order of operations.

1.4: Evaluate variable expressions.

1.5: Simplify exponential expressions.

1.6: Write expressions in exponential form.

1.7: Translate word phrases into variable expressions.

1.8: Translate variable expressions and equations into word phrases.

Goal 2: The learner will identify and apply properties of real numbers.

2.1: Identify and apply the properties of zero for both addition and multiplication.
2.2: Identify and apply the property of one for multiplication.
2.3: Identify and apply the commutative and associative properties of addition and multiplication to simplify expressions or computational processes.
2.4: Identify and apply the distributive property.

Goal 3: The learner will solve linear equations and inequalities in one variable.

3.1: Solve an equation by using the addition or subtraction property of equality.
3.2: Solve an equation by using the multiplication or division property of equality.
3.3: Solve an equation by using more than one property of equality.
3.4: Solve an equation graphically.
3.5: Solve an equation by using the distributive property.
3.6: Solve an equation which contains similar terms.
3.7: Find the solution set for a linear inequality when replacement values are given for the variable.
3.8: Solve a linear inequality by using transformations.
3.9: Use a linear equation to solve problems.
3.10: Use formulas to solve problems.
3.11: Use inequalities to solve problems.

Goal 4: The learner will use ratios, proportions, and percents to solve problems.

4.1: Write a ratio in lowest terms.
4.2: Solve a proportion.
4.3: Use a ratio or a proportion to solve problems.
4.4: Solve problems involving percents.

Goal 5: The learner will perform operations with real numbers.

5.1: Determine the additive or multiplicative inverse of a number.
5.2: Distinguish between rational and irrational numbers.
5.3: Determine the absolute value of expressions.
5.4: Compare real number expressions.
5.5: Simplify variable expressions involving addition and subtraction.
5.6: Simplify variable expressions involving multiplication and division.
5.7: Simplify real number expressions with or without a calculator.
5.8: Simplify radicals.
5.9: Multiply or divide two radical expressions.
5.10: Use a calculator to find the approximate square root of a number.
5.11: Add or subtract radical expressions.
5.12: Use the Pythagorean Theorem to solve problems.

Goal 6: The learner will demonstrate an elementary understanding of relations and functions.

6.1: Graph and locate sets of real numbers on a number line.
6.2: Graph ordered pairs of numbers on the coordinate plane and interpret information related to these sets of points.
6.3: Find the distance between two points on a number line.
6.4: Graph a relation on the coordinate plane.
6.5: Graph a relation given an equation and a domain.
6.6: Identify intercepts as numbers.

Goal 7: The learner will solve and graph linear equations and inequalities.

    7.1: Graph an inequality on a number line.
    7.2: Solve an inequality and graph its solution set.
    7.3: Determine if data are behaving in a linear fashion.
    7.4: Find the solution set of open sentences in two variables when given replacement sets for the variables.
    7.5: Graph a linear equation in two variables.

Goal 8: The learner will solve linear equations with two variables.

    8.1: Solve systems of linear equations.
    8.2: Use substitution to solve systems of linear equations.
    8.3: Identify inconsistent systems.
    8.4: Use a computer or graphics calculator to solve systems of linear equations.

Goal 9: The learner will perform operations with polynomials.

    9.1: Use models to represent polynomials.
    9.2: Use models to find the sum or difference of two polynomials.
    9.3: Add and subtract polynomials.
    9.4: Multiply monomials.
    9.5: Find an indicated power of a monomial.
    9.6: Multiply a polynomial by a monomial.
    9.7: Divide two monomials.

Goal 10: The learner will simplify expressions with algebraic fractions.

    10.1: Simplify algebraic fractions.
    10.2: Use the distributive property to simplify fractions.
    10.3: Multiply algebraic fractions.
    10.4: Divide algebraic fractions.

Subject: Algebra I-B

Goal 1: The learner will perform operations with real numbers.

    1.1: Add or subtract real numbers.
    1.2: Multiply or divide real numbers.
    1.3: Use the order of operations to simplify expressions.
    1.4: Evaluate exponential expressions.
    1.5: Evaluate polynomials.
    1.6: Interpret zero as an exponent.
    1.7: Interpret negative exponents.
    1.8: Write numbers in scientific notation and use this notation with the calculator.
    1.9: Simplify real number expressions with and without a calculator.

Goal 2: The learner will identify the properties of real numbers and apply them to numerical and algebraic expressions.

    2.1: Recognize and use properties of addition.
    2.2: Recognize and use properties of multiplication.
    2.3: Use the distributive property to simplify expressions.
    2.4: Use the distributive property to factor a common monomial term in an algebraic expression.
    2.5: Use number properties to combine like terms.

Goal 3: **The learner will solve linear equations and inequalities with one variable and graph their solutions.**

  3.1: Solve an equation by using the addition property of equality and the idea of an additive inverse.

  3.2: Solve an equation by using the multiplication property of equality and the idea of a multiplicative inverse.

  3.3: Solve an equation graphically or by using more than one property of equality.

  3.4: Solve an equation which has a variable in both members.

  3.5: Translate word statements into equations and solve them.

  3.6: Solve an equation in which the numerical coefficient is a fraction.

  3.7: Solve a formula for one of its variables or find the value of a variable when values of other variables are given.

  3.8: Use formulas to solve problems.

  3.9: Graph an inequality on a number line.

  3.10: Find the solution set of a linear inequality when replacement values are given for the variable.

  3.11: Solve a linear inequality by using transformations.

  3.12: Use inequalities to solve problems.

  3.13: Find the solution set of combined inequalities.

  3.14: Solve a simple equation involving absolute value.

Goal 4: **The learner will demonstrate an elementary understanding of relations and functions.**

  4.1: Graph ordered pairs of numbers on the coordinate plane and interpret information related to those sets of points.

  4.2: Graph a relation on the coordinate plane.

  4.3: Distinguish between a relation and a function.

  4.4: Graph a relation given an equation and a domain.

  4.5: Sketch a reasonable graph for a given relationship.

  4.6: Interpret a graph in a real-word setting.

  4.7: Use a computer or graphing calculator to explore the graphs of functions.

  4.8: Compare ordered pairs of numbers to the line $y = x$ and interpret the result.

Goal 5: **The learner will simplify radical expressions which contain variables.**

  5.1: Simplify square root radicals.

  5.2: Simplify radical expressions involving products and quotients.

  5.3: Simplify the sums and differences of radical expressions.

  5.4: Find the approximate square root of a number with and without a calculator.

  5.5: Compare real number expressions.

  5.6: Multiply two binomials which contain square roots.

  5.7: Solve equations which contain radicals.

Goal 6: **The learner will graph and solve systems of linear equations and inequalities.**

  6.1: Solve a system of two linear equations in two variables by graphing.

  6.2: Solve a system of two linear equations by the substitution method.

  6.3: Use the addition or subtraction method to find the solution to a pair of linear equations in two variables.

  6.4: Use multiplication with the addition or subtraction method to solve a system of linear equations.

  6.5: Use systems of linear equations to solve problems.

Goal 7: The learner will perform operations with polynomials.

    7.1: Add and subtract polynomials.
    7.2: Multiply polynomials.
    7.3: Divide a polynomial by a monomial.
    7.4: Divide polynomials.
    7.5: Find the product of two binomials.
    7.6: Factor a trinomial.
    7.7: Find the square root of a binomial.
    7.8: Factor a perfect square trinomial.
    7.9: Find the product of a sum and a difference.
    7.10: Factor the difference of two squares.

Goal 8: The learner will work with ratios, proportions, and percents.

    8.1: Simplify ratios involving algebraic expressions.
    8.2: Solve proportions.
    8.3: Use ratios and proportions to solve problems.
    8.4: Solve problems involving percents.

Goal 9: The learner will simplify expressions with algebraic fractions.

    9.1: Find the Least Common Multiple (LCM) of algebraic expressions.
    9.2: Add algebraic fractions with like denominators.
    9.3: Subtract algebraic fractions with like denominators.
    9.4: Add algebraic fractions with unlike denominators.
    9.5: Subtract algebraic fractions with unlike denominators.

Goal 10: The learner will analyze linear equations.

    10.1: Write linear equations in slope-intercept form.
    10.2: Find the slope of a non-vertical line given two points on the line.
    10.3: Graph a line given its slope and y-intercept.
    10.4: Determine the slope of a line from its graph.
    10.5: Determine the slope of a line from its equation.

Goal 11: The learner will explore, graph, and interpret non-linear equations.

    11.1: Graph a quadratic equation.
    11.2: Use an automatic grapher to find the solution to a quadratic equation.
    11.3: Solve a quadratic equation when one member is in factored form and the other member is zero.
    11.4: Solve a quadratic equation in which a perfect square equals a constant.
    11.5: Solve a quadratic equation by factoring.
    11.6: Understand that the vertex provides the maximum or minimum value of the function.
    11.7: Solve a quadratic equation by using the quadratic formula.
    11.8: Use quadratic equations to solve problems.
    11.9: Determine if a set of data represents an exponential function.
    11.10: Use formulas, calculators, and automatic graphers to explore and solve problems involving exponentials.

Subject: Algebra I

Goal 1: The learner will use the language of algebra.

    1.1: Evaluate algebraic expressions.
    1.2: Use formulas to solve problems.
    1.3: Translate word phrases and sentences into expressions and equations and vice versa.
    1.4: Use the associative, commutative and distributive properties.

Goal 2: The learner will perform operations with real numbers.

2.1: Simplify real number expressions with and without a calculator.
2.2: Determine the additive or multiplicative inverse of a number.
2.3: Determine the absolute value of expressions.
2.4: Raise a real number to an indicated power.
2.5: Write numbers in scientific notation and use this notation with a calculator.
2.6: Distinguish between rational and irrational numbers.
2.7: Find approximations for square roots with and without a calculator.
2.8: Simplify radical expressions.
2.9: Multiply two binomials which contain square roots.
2.10: Compare real number expressions.

Goal 3: The learner will solve equations and inequalities with one variable.

3.1: Solve an equation by using the addition property of equality and the idea of additive inverse.
3.2: Solve a simple equation by using the multiplication property of equality and the idea of multiplicative inverse.
3.3: Solve an equation graphically and by using more than one property of equality.
3.4: Solve an equation which contains similar terms.
3.5: Solve an equation which has the variable in both members.
3.6: Solve an equation in which the numerical coefficient is a fraction.
3.7: Solve a formula for one of its variables or find the value of a variable when values of the other variables are given.
3.8: Use problem solving skills to solve real-world and "word" problems which involve a linear equation or a formula.
3.9: Solve a simple equation involving absolute value.
3.10: Solve a simple equation containing a radical.
3.11: Find the solution set for a linear inequality when replacement values are given for the variable.
3.12: Solve a linear inequality by using transformations.
3.13: Use inequalities to solve problems.
3.14: Find the solution set of combined inequalities.

Goal 4: The learner will demonstrate an elementary understanding of relations and functions.

4.1: Graph and locate sets of real numbers on a number line.
4.2: Graph ordered pairs of numbers on the coordinate plane and interpret information related to these sets of points.
4.3: Find the distance between two points on a number line.
4.4: Graph the relation on the coordinate plane.
4.5: Distinguish between a relation and a function.
4.6: Graph a relation given an equation and domain.
4.7: Sketch a reasonable graph for a given relationship.
4.8: Interpret a graph in a real-world setting.
4.9: Use a computer or graphing calculator to explore the graphs of functions.
4.10: Compare ordered pairs to the line $y = x$ and interpret the results.

Goal 5: The learner will graph and use linear equations and inequalities.

   5.1: Determine if data are behaving in a linear fashion.

   5.2: Find the solution set of open sentences in two variables when given replacement sets for the variables.

   5.3: Graph a linear equation in two variables.

   5.4: Graph a line given its slope and y-intercept.

   5.5: Find the slope of a non-vertical line given the graph of a line or an equation of the line or two points on the line.

   5.6: Describe the slope in a real-world linear relationship using real-world terms.

   5.7: Write the slope-intercept form of an equation of a line.

   5.8: Write the equation of a line given the slope and one point on the line, or two points on the line.

   5.9: Write the equation of a line which models a set of real data.

  5.10: Use the line which models real data to make predictions.

  5.11: Graph a linear inequality in two variables.

Goal 6: The learner will graph and solve systems of linear equations and inequalities.

   6.1: Use a graph to find the solution of a pair of linear equations in two variables.

   6.2: Graph the solution set of a system of linear inequalities in two variables.

   6.3: Use a computer or graphics calculator to solve systems of linear equations.

   6.4: Use the substitution method to find the solution of a pair of linear equations in two variables.

   6.5: Use the addition or subtraction method to find the solution of a pair of linear equations in two variables.

   6.6: Use multiplication with the addition or subtraction method to solve systems of linear equations.

   6.7: Use systems of linear equations to solve problems.

Goal 7: The learner will perform operations with polynomials.

   7.1: Add and subtract polynomials.

   7.2: Multiply monomials.

   7.3: Find an indicated power of a monomial.

   7.4: Multiply a polynomial by a monomial.

   7.5: Find the product of two binomials.

   7.6: Multiply two polynomials.

   7.7: Divide two monomials.

   7.8: Divide a polynomial by a monomial.

   7.9: Find a common monomial factor in a polynomial.

  7.10: Factor the difference of two squares.

  7.11: Factor a simple quadratic trinomial.

Goal 8: The learner will work with ratios, proportions, and percents.

   8.1: Simplify ratios involving algebraic expressions.

   8.2: Solve proportions.

   8.3: Use ratios and proportions to solve problems.

   8.4: Solve problems involving percents.

Goal 9: The learner will explore, graph, and interpret nonlinear equations.

   9.1: Graph a quadratic equation.

   9.2: Use an automatic grapher to find the solution to a quadratic equation.

   9.3: Solve a quadratic equation when one member is in factored form and the other member is zero.

   9.4: Solve a second degree equation be factoring.

   9.5: Use an automatic grapher to relate the solutions of quadratic equations and the x-intercepts.

   9.6: Understand that the vertex provides the maximum or minimum value of a function.

   9.7: Solve a quadratic equation in which a perfect square equals a constant.

   9.8: Solve a quadratic equation by using the quadratic formula.

   9.9: Use quadratic equations to solve problems.

  9.10: Determine if a set of data represents an exponential function.

  9.11: Use formulas, calculators and automatic graphers to explore and solve problems involving exponentials.

Subject: Technical Math

Goal 1: **The learner will use and read measuring devices and solve problems involving the customary and metric units of measurements.**

    1.1: Find the mass/weight of objects using customary and metric units.

    1.2: Find the volume/capacity of quantities using customary and metric units.

    1.3: Compare and convert measurement units as needed to perform calculations, using a calculator when needed.

    1.4: Use common measuring tools and solve problems involving the measurements.

    1.5: Compare measurements to specified tolerances.

    1.6: Use significant digits to indicate accuracy of measurement.

    1.7: Select the appropriate measuring tool and units of measure to solve a problem.

Goal 2: **The learner will use ratios, proportions, and percents to solve problems.**

    2.1: Read, interpret and compare ratios.

    2.2: Recognize and write proportions from given information.

    2.3: Distinguish between direct and indirect relationships.

    2.4: Solve problems involving proportions.

    2.5: Solve problems involving percents.

    2.6: Interpret and construct maps and scale drawings.

    2.7: Find the magnitude and direction of a vector.

    2.8: Solve problems using signed numbers and vectors.

Goal 3: **The learner will solve geometric problems involving two- and three-dimensional shapes.**

    3.1: Identify polygons and their properties.

    3.2: Calculate the perimeter, area, and circumference of polygons and circles.

    3.3: Identify common three-dimensional shapes.

    3.4: Calculate the surface area and the volume of three-dimensional shapes.

    3.5: Solve problems involving common geometric properties.

    3.6: Draw auxiliary diagrams to help solve for an unknown dimension or an unknown angle in both plane and solid shapes.

    3.7: Solve both plane and solid geometry problems that involve a series of successive calculations.

Goal 4: **The learner will analyze patterns and functions.**

    4.1: Decode and extend patterns.

    4.2: Identify the domain and range of mathematical relations and functions.

    4.3: Distinguish between mathematical relations and functions.

    4.4: Use patterns and functions to solve problems at home and at work.

Goal 5: **The learner will solve problems using triangle relationships.**

    5.1: Use the Pythagorean Theorem to find a side of a right triangle.

    5.2: Use the characteristics of $3:4:5$, $45°$-$45°$-$90°$, and $30°$-$60°$-$90°$ right triangles to solve practical problems.

    5.3: Use the ratios for the sine, cosine, and tangent of an angle to solve problems that involve right triangles.

    5.4: Solve problems involving the Law of Cosines and the Law of Sines.

Goal 6: **The learner will graph and analyze trigonometric functions.**

    6.1: Draw a graph of sine and cosine waves.

    6.2: Find the amplitude, wave length, period, and frequency of sine waves.

    6.3: Find the phase shift between two sine waves.

N.C. Objectives

Goal 7: The learner will use formulas to solve problems.

7.1: Translate a problem into an equation.
7.2: Evaluate algebraic expressions and formulas when replacement values are given.
7.3: Select an appropriate formula to solve a problem.
7.4: Solve problems with formulas using a calculator when needed.
7.5: Solve problems that involve powers and roots.

Goal 8: The learner will solve problems that involve nonlinear equations.

8.1: Recognize nonlinear equations (involving squares, square roots and reciprocals of the variable) and become familiar with their graphs.
8.2: Solve and graph a nonlinear equation.
8.3: Read values from the graph of a nonlinear equation.

Goal 9: The learner will solve problems involving systems of equations and inequalities.

9.1: Write equations and inequalities in terms of two unknowns.
9.2: Solve systems of equations.
9.3: Solve problems involving inequalities.
9.4: Solve linear programming problems.

Goal 10: The learner will use statistics to analyze and solve real-world problems.

10.1: Distinguish between mean, mode, and median as measures of central tendency.
10.2: Calculate the mean, mode, and median for a set of data.
10.3: Draw and interpret a histogram to represent frequency distribution of data.
10.4: Distinguish between range, trend, and standard deviation as measures of variability.
10.5: Interpret the characteristics of a normal curve.
10.6: Calculate the range and standard deviation to describe a set of data.

Goal 11: The learner will use probability to solve real-world problems.

11.1: Find the probability of some simple events.
11.2: Count the number of ways an event can happen.
11.3: Draw diagrams and charts to help find the probability of an event.

Goal 12: The learner will solve problems using computer technology.

12.1: Load and use simple spreadsheet templates to solve practical problems.
12.2: Use an appropriate graphics program to produce bar graphs, circle graphs, and line graphs.
12.3: Use an appropriate graphics program to graph linear and nonlinear functions.
12.4: Use an appropriate graphics program to graph one or more curves and determine such characteristics as their slope, roots, and intersection points.
12.5: Use an appropriate graphics program to determine the effect of varying parameters in an equation on the shape of the curve representing the graphed equation.

Subject: Geometry

Goal 1: The learner will use concepts of points, lines, and planes in one, two, and three dimensions.

1.1: Identify and name sets of points such as line, ray, segment, and plane.
1.2: Draw representations of points, lines and planes.
1.3: Identify interior and exterior points in two-dimensional and three-dimensional figures.
1.4: Find the coordinates of a point in a plane or in space.
1.5: Find the length of a segment on a line, in a plane, or in space.
1.6: Apply the segment addition postulate (definition of betweenness).
1.7: Use lengths to solve problems involving geometric probabilities.
1.8: Identify the midpoint of a given segment on a line, in a plane or in space.

Goal 2: The learner will write a valid proof using a variety of reasoning strategies.

    2.1: Identify the structure of geometric deductive reasoning (undefined term, postulates, theorems).
    2.2: State and use properties of equality and inequality.
    2.3: Write and interpret statements in if-then form.
    2.4: State the converse, inverse, and contrapositive of the conditional.
    2.5: Write a proof using a flow diagram.
    2.6: Write proofs using a two-column format.
    2.7: Write proofs using a paragraph format.
    2.8: Write indirect proofs.

Goal 3: The learner will use properties of angles, lines, and planes to solve problems and write proofs.

    3.1: Use the definitions of adjacent, vertical, linear pair, complementary and supplementary angles to solve problems and write proofs.
    3.2: Use the angle addition postulate to solve problems and write proofs.
    3.3: Use the definition of angle bisector to solve problems and write proofs.
    3.4: Use the definitions of parallel lines, perpendicular lines, and perpendicular bisectors to solve problems and write proofs.
    3.5: Use the relationships which exist between special pairs of angles formed by parallel lines and a transversal to solve problems and write proofs.
    3.6: Use slopes to determine if two lines are parallel or perpendicular.
    3.7: Write the equation of a line parallel or perpendicular to a given line through a given point.

Goal 4: The learner will use properties of polygons and polyhedra to solve problems and write proofs.

    4.1: Model and describe convex polygons and regular polygons.
    4.2: Use the measures of the interior and exterior angles of a convex polygon to solve problems.
    4.3: Use the properties of proportions to solve problems.
    4.4: Use properties of congruent and similar polygons to solve problems and write proofs.
    4.5: Investigate a variety of transformations on polygons (tessellation, slide, rotation, flip) in a coordinate plane.
    4.6: Model and describe regular and non-regular polyhedra.
    4.7: Identify congruent or similar polyhedra.
    4.8: Determine coordinates of the vertices of polygons in a plane.
    4.9: use coordinate geometry to verify conclusions regarding polygons.

Goal 5: The learner will develop and use properties to solve problems and write proofs.

    5.1: Use the definitions and properties of parallelograms to solve problems and write proofs.
    5.2: Develop and use properties of rectangles, rhombi, and squares to solve problems and write proofs.
    5.3: Use the definition and properties of trapezoids and isosceles trapezoids to solve problems and write proofs.
    5.4: Given quadrilaterals in a coordinate plane, solve problems and construct proofs.

Goal 6: The learner will develop and use properties of triangles to solve problems and write proofs.

    6.1: Classify triangles according to sides and angles.
    6.2: Explore the relationships of the lengths of the sides of a triangle.
    6.3: Investigate and apply theorems involving the interior and exterior angles of a triangle.
    6.4: Use postulates and theorems to prove that two triangles and their corresponding parts are congruent.
    6.5: Construct congruent triangles using congruency postulates and theorems.
    6.6: Investigate and apply special theorems involving isosceles triangles.
    6.7: Investigate and apply definitions and theorems involving altitudes, perpendicular bisectors, and medians.
    6.8: Investigate and apply the theorem involving the segment joining the midpoints of two sides of a triangle.
    6.9: Apply theorems involving segments divided proportionally.
    6.10: Given triangles in the coordinate plane, solve problems and write proofs.

Goal 7: The learner will develop and use properties of right triangles to solve problems.

7.1: Find the geometric mean between a pair of numbers.
7.2: Use the Pythagorean Theorem and its converse to solve problems.
7.3: Use the relationship in a special right triangle to solve problems and write proofs.
7.4: State and apply the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle.
7.5: Use a calculator to apply the definitions of sine, cosine, and tangent to solve problems.
7.6: Use coordinate methods to solve problems and write proofs related to right triangles.

Goal 8: The learner will develop and use properties of circles and spheres to solve problems and write proofs.

8.1: Identify and use the definition of a circle and sets of points related to the circle.
8.2: Find the center of a circle which passes through three non-collinear points.
8.3: Describe the relationship between tangents and circles.
8.4: Apply properties involving arcs and angles of circles.
8.5: Apply theorems that relate the chords of a circle, excluding the product theorem.
8.6: Apply theorems that relate to the tangents, secants, and radii of a circle, excluding the product theorems.
8.7: Describe the relationship between the equation of a circle, its center and radius length.
8.8: Discuss the relationships of congruent, similar, and concentric circles.
8.9: Explore spheres and sets of points related to the sphere.

Goal 9: The learner will understand and use perimeter, area, and volume formulas to solve problems.

9.1: Find the perimeter of a geometric figure.
9.2: Find the area of a triangle, parallelogram, trapezoid, and rectangle.
9.3: Find the ratio of the perimeters, areas, and volumes of similar geometric figures.
9.4: Find the circumference and area of a circle.
9.5: Compute arc lengths and the area of sectors of a circle.
9.6: Use areas to solve problems involving geometric probability.
9.7: Find the lateral area, total area, and volume of a right prism, pyramid, right circular cylinder and cone.
9.8: Compute the surface area and volume of a sphere to solve problems.
9.9: Use an automatic grapher to solve "Max-Min" problems.

Subject: Algebra II

Goal 1: The learner will solve, graph and use equations and inequalities.

1.1: Solve literal equations and formulas for a specified variable.
1.2: Use an automatic grapher to estimate solutions of linear and absolute value equations and inequalities.
1.3: Solve and graph equations and inequalities involving absolute value.
1.4: Interpret the slope and intercepts of a line.
1.5: Apply the concepts of parallel and perpendicular lines as determined by a comparison of their slopes.
1.6: Write and use an equation of a line which models a set of linear data.
1.7: Use an automatic grapher to fit a line to a set of linear data. Interpret the slope, intercepts and quality of fit.

Goal 2: The learner will demonstrate an understanding of relations and functions.

2.1: Determine if a given relation is a function.
2.2: Identify the domain and range of a relation.
2.3: Use function notation.
2.4: Graph relations and functions with and without an automatic grapher.
2.5: Find the zeros of a function by examining a graph.
2.6: Solve an inequality by examining the graph of the function.
2.7: Communicate graphically, algebraically, and verbally real world phenomena as functions.
2.8: Find the composition of functions.
2.9: Use iterative definitions of functions.

Goal 3: The learner will operate with matrices.

3.1: Organize data into an array or a matrix.
3.2: Add and subtract matrices with and without calculators.
3.3: Use scalar multiplication and multiply matrices with and without calculators.
3.4: Solve real-world problems using matrices.
3.5: Write and solve systems of linear equations in matrix form.
3.6: Solve matrix equations of the form $AX = B$ using calculators or computers.

Goal 4: The learner will graph and solve systems of equations and inequalities.

4.1: Solve systems of two equations graphically with and without an automatic grapher.
4.2: Solve systems of two equations in two variables.
4.3: Solve systems of three equations in three variables.
4.4: Use systems of equations and inequalities to solve problems.
4.5: Solve systems of inequalities by graphing.
4.6: Use linear programming to solve real-world problems.

Goal 5: The learner will perform operations and solve problems with polynomials.

5.1: Divide one polynomial by another of a lower degree.
5.2: Use synthetic division to divide a polynomial by a linear binomial.
5.3: Factor polynomials completely.
5.4: Use factoring to solve polynomial equations.
5.5: Use polynomial equations to solve problems.
5.6: Expand powers of binomials using Pascal's triangle of the binomial theorem.
5.7: Write a polynomial equation given its solutions.

Goal 6: The learner will use rational expressions to solve problems.

6.1: Simplify ratios involving algebraic expressions.
6.2: Use expressions involving negative exponents.
6.3: Find sums and differences of rational algebraic expressions.
6.4: Find products and quotients of rational algebraic expressions.
6.5: Simplify complex fractions.
6.6: Solve fractional equations.
6.7: Solve problems involving fractional equations.
6.8: Solve problems of direct and inverse variation.
6.9: Use joint and combined variation to solve problems.

Goal 7: The learner will solve problems with quadratic equations and inequalities.

7.1: Complete the square to solve quadratic equations.
7.2: Use the quadratic formula to solve quadratic equations.
7.3: Define complex numbers and perform basic operations with them.
7.4: Solve quadratic inequalities.
7.5: Determine the solutions of quadratic and other polynomial equations using an automatic grapher.
7.6: Solve problems using quadratic equations and inequalities.
7.7: Interpret the maximum and minimum values of a quadratic function.
7.8: Use the discriminant of a quadratic equation to determine the nature of the roots and the number of x-intercepts of the graph.
7.9: Explore the relationship between coefficients and solutions of a quadratic equation.
7.10: Solve equations which contain radical expressions.
7.11: Explore complex numbers as solutions to quadratic equations.

Goal 8: The learner will use analytic geometry to solve problems.

8.1: Use the distance and midpoint formulas.
8.2: Write the equations of and graph circles and parabolas given their geometric properties.
8.3: Explore the equations of and graph ellipses and hyperbolas.

Goal 9: The learner will solve problems involving logarithmic and exponential functions.

   9.1: Use expressions involving fractional exponents.
   9.2: Write an exponential function of the form $f(x) = a \cdot b^x$ given the base and a point.
   9.3: Graph exponential functions of the form $f(x) = a \cdot b^x$.
   9.4: Use exponential equations of the form $f(x) = (1+r)^x$, where r is given as a rate of growth.
   9.5: Apply the definitions of logarithms.
   9.6: Use properties of logarithms and exponents.
   9.7: Use logarithms to solve expressions of the form $a \cdot b^x = c$ for x.

Goal 10: The learner will solve problems involving sequences and series.

   10.1: Generate the terms of an arithmetic series by iteration.
   10.2: Use a calculator or computer to generate the terms of a geometric series by iteration.
   10.3: Use summation notation to describe the sums in a series.

Goal 11: The learner will solve problems involving probability.

   11.1: Find the probabilities of independent events by multiplying probabilities.
   11.2: Find the probabilities of mutually exclusive events by adding probabilities.
   11.3: Use tree diagrams to model situations involving both the multiplication and addition principles.
   11.4: Understand the meaning of probabilistic statements.

Subject: Advanced Math

Goal 1: The learner will model real-world phenomena using techniques of data analysis.

   1.1: Recognize a mathematical model of linear, quadratic, exponential, trigonometric, and logarithmic functions.
   1.2: Use a scatter plot to determine if a given model is appropriate.
   1.3: Find the equation of a line that models a bivariate linear data set.
   1.4: Use the linear least squares method to fit linear data.
   1.5: Interpret the slope and y-intercept of a linear model.
   1.6: Determine the goodness-of-fit of a model using residuals and/or correlation coefficients.
   1.7: Use models where appropriate to draw conclusions or make predictions.

Goal 2: The learner will graph, transform, use as mathematical models, and compose basic functions.

   2.1: Sketch graphs of the basic functions (constant, linear, quadratic, cubic, square root, absolute value, reciprocal, trigonometric, exponential, logarithmic, and greatest integer).
   2.2: Compare information given by local behavior versus global behavior on graphs produced on an automatic grapher.
   2.3: Find the domain of a function.
   2.4: Estimate the range of a function.
   2.5: Determine the symmetry of a given graph.
   2.6: Identify continuous and discontinuous functions and locate points of discontinuity.
   2.7: Graph transformations and combinations of transformations for all basic functions.
   2.8: Find coordinates of zeros and maximum or minimum points of a given function.
   2.9: Write the equation of a function from a description of its behavior.
  2.10: Solve inequalities using an automatic grapher or number line analysis.
  2.11: Compose two functions and find the domain of the composition.
  2.12: Analyze a function by decomposing it into simpler functions.
  2.13: Find the inverse of a function and the domain of the inverse.

Goal 3: The learner will graph and use as models polynomial and rational functions.

3.1: Find zeros and factors of polynomials algebraically (where appropriate) and/or using an automatic grapher.

3.2: Estimate the turning points of polynomial functions using an automatic grapher.

3.3: Find the zeros and vertical asymptotes of a rational function through analysis of the polynomials in the numominator and denominator.

3.4: Find the horizontal asymptote of a rational function by comparing the growth of the polynomials in the numerator and denominator.

3.5: Sketch the graph of a rational function labeling the horizontal and vertical asymptotes and the x- and y-intercepts.

Goal 4: The learner will graph, transform, and solve problems involving the exponential and logarithmic functions.

4.1: Model growth using transformations of: $f(x) = ab^x$ and $f(x) = (1+r)^x$.

4.2: Define and use the logarithmic function as the inverse of the exponential function.

4.3: Find the domain of exponential and logarithmic functions.

4.4: Sketch and investigate the graphs of composition of exponential and logarithmic functions with each other and with other basic functions.

4.5: Solve equations containing exponential and logarithmic functions using real-world problems.

Goal 5: The learner will use techniques of data analysis to model nonlinear data from real-world phenomena.

5.1: Linearize data using concepts of composition and inverses in order to find a model of data.

5.2: Rewrite the linear equation that models linearized data to fit the original curved data.

5.3: Discuss the goodness-of-fit of the model used to represent data.

5.4: Use log-log re-expression to linearize data of the form $y = a \cdot x^b$ by plotting $(\log x, \log y)$.

Goal 6: The learner will graph and transform trigonometric functions, solve trigonometric equations and inequalities, and use trigonometric functions as mathematical models.

6.1: Use trigonometric functions to model periodic phenomena.

6.2: Express the tangent, cotangent, secant, and cosecant functions in terms of sine and cosine.

6.3: Sketch a graph of each of the six trigonometric functions and identify the period of each.

6.4: Recognize and graph transformations of each of the six trigonometric functions.

6.5: Use graphs to develop, recognize, and validate trigonometric identities.

6.6: Understand how the values of sine and cosine are represented on the unit circle.

6.7: Use the symmetry of the unit circle to develop, recognize, and validate trigonometric identities.

6.8: Understand the relationship between trigonometry in degree mode and trigonometry in radian mode.

6.9: Find the radian measure that corresponds to a given angle or arc length.

6.10: Solve trigonometric equations and inequalities either algebraically or using an automatic grapher.

6.11: Find the values of inverse trigonometric functions, applying appropriate domain and range restrictions.

6.12: Evaluate and graph compositions of trigonometric and inverse trigonometric functions.

6.13: Use the Law of Sines and Law of Cosines to solve problems involving triangles and vectors.

6.14: Convert complex numbers from rectangular form to polar form.

6.15: Convert complex numbers from polar form to rectangular form.

6.16: Use DeMoivre's Theorem to find roots and powers of complex numbers.

6.17: Use an automatic grapher to explore polar equations.

Goal 7: The learner will use discrete mathematics concepts to solve problems.

7.1: Follow an algorithm.

7.2: Use operations with matrices and the inverse of a matrix to solve real world problems.

7.3: Use permutations and combinations to solve problems.

7.4: Classify events as independent or dependent or mutually exclusive.

7.5: Interpret data in terms of mean and standard deviation.

7.6: Recognize and use the normal distribution curve to interpret data.

7.7: Find indicated terms in sequences.

7.8: Find the sum of a finite series.

7.9: Find the limit of an infinite sequence.

7.10: Determine whether a given series converges or diverges.

7.11: Use mathematical induction to establish a generalization.

Subject: AP Calculus

Goal 1: Use elementary functions, including algebraic, trigonometric, exponential, and logarithmic.

1.1: Define a function and relate the idea of function to real situations.

1.2: Find the domain and range of a function with and without an automatic grapher.

1.3: Find the sum, product, and quotient of two functions.

1.4: Find the composition of two functions.

1.5: Find the domain of a composition of two functions.

1.6: Find and apply the absolute value of a function.

1.7: Find and use the inverse of a function.

1.8: Determine if a function is odd, even, or neither odd nor even.

1.9: Determine periodicity and amplitude of a function.

1.10: Describe the symmetry of a function.

1.11: Find the asymptotes of a function.

1.12: Find the zeros of a function.

1.13: Use a^x and $\log_a x$ and their inverse relationships.

Goal 2: Find and use limits of various functions.

2.1: Find limits of functions by direct substitution.

2.2: Find the limit of a quotient of indeterminant form.

2.3: Find the limit of a function as the independent variable approaches infinity.

2.4: Find the limit of a function by examining its graph.

2.5: Recognize the limit of special functions.

2.6: Recognize that functions have non-existent limits.

Goal 3: Use the definition of continuity.

3.1: Apply the definition of continuity and find excluded values of a discontinuous function.

3.2: Use the statement: "If f is continuous on $[a, b]$, then f has a maximum and a minimum on $[a, b]$."

3.3: Apply the intermediate value theorem.

Goal 4: Use the concepts of differential calculus.

4.1: Understand the concept of the derivative.
4.2: State and apply the definitions of the derivative.
4.3: Find the derivatives of elementary functions.
4.4: Find the derivative of a sum, product, and quotient.
4.5: Find the derivative of a composite function (chain rule).
4.6: Find the derivative of an implicitly defined function.
4.7: Find the derivative of the inverse of a function.
4.8: Use logarithmic differentiation.
4.9: Find derivatives of higher order.
4.10: Apply the Mean Value Theorem.
4.11: Use the relation between differentiability and continuity.
4.12: Use L'Hopital's rule.

Goal 5: Apply the concepts of a derivative.

5.1: Find the slope of a curve.
5.2: Find the tangent line to a curve.
5.3: Find the normal line to a curve.
5.4: Use the derivative to approximate values.
5.5: Use Newton's Method to approximate the zeros of a function.
5.6: Determine where a function is increasing and where it is decreasing.
5.7: Find critical points, relative (local) and absolute maximum and minimum points.
5.8: Determine the concavity and points of inflection of a function.
5.9: Use the graph of the derivative of a function to identify information about the function.
5.10: Solve extreme value problems.
5.11: Find the velocity and the acceleration of a particle moving along a line.
5.12: Find average rates of change.
5.13: Find instantaneous rates of change.
5.14: Determine related rates of change.

Goal 6: Use the concepts of integral calculus.

6.1: Find antiderivatives.
6.2: Find the distance and velocity from acceleration with initial conditions.
6.3: Solve simple (variable separable) first order differential equations.
6.4: Apply solutions of $y' = ky$ to growth and decay problems.
6.5: Use basic integration formulas.
6.6: Use substitution to integrate.
6.7: Do simple integration by parts.
6.8: Approximate the area under a curve using rectangles or trapezoids.
6.9: Recognize the definition of the definite integral as the limit of a sum.
6.10: Understand the concept of the definite integral.
6.11: Apply properties of the definite integral.
6.12: Use the Fundamental Theorems $\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$ and $\int_a^b f(x)\,dx = F(b) - F(a)$ where $F'(x) = f(x)$.

Goal 7: Apply the concept of the definite integral.

7.1: Find the average (mean) value of a function on an interval.
7.2: Find the area between curves.
7.3: Find the volume of a solid of revolution about the axes or lines parallel to the axes.
7.4: Find the volume of a solid with a known cross section.