



Middle School Math

2009-2010

Mathematics Applications and Concepts: Glencoe Mathematics

Mathematics Applications and Concepts is a comprehensive, well-balanced, three course program that will prepare middle school students for success in algebra and geometry. Each course is divided into chapters which present related topics in several sections. Students have the opportunity to explore the corresponding topic with different methods, learn the appropriate vocabulary terms, and find the connection to real world applications.

Course 1: Glencoe: *Mathematics Applications and Concepts - Book 1* and

Creative Learning: *Problem Solver 6*

Concepts and skills include:

NUMBERS AND OPERATIONS: Read and write decimals, place value, compare and order, round decimals, relate decimals and fractions, relate decimals, ratios and percents, terminating and repeating decimals, scientific notation, power of ten. Add, subtract, multiply and divide decimals. Fractions, mixed numbers and improper fractions, equivalent fractions, compare and order fractions, simplify fractions, LCD, round and estimate fractions, relate fractions and decimals, relate fractions and percents, represent probability using fractions, decimals and percents. Add, subtract, multiply and divide fractions with like and unlike denominators and mixed numbers. Read and write ratios, simplify ratios, use in problem situations, relate ratios and fractions, rate, unit rate. Proportions, property of proportions (cross products), similar figures. Percents, fractions and decimals as percents, relate percent and ratio, percent of a number. Whole numbers, positive exponents, divisibility patterns, prime and composite numbers, prime factorization, GCF, LCM. Read and write integers, graph integers in a number line, compare and order integers, absolute value. Add, subtract, multiply and divide integers. Associative property, commutative property, distributive property, identity property, property of equality. Estimation of decimals, fractions, percents, using rounding, compatible numbers, clustering, and mental math.

PATTERNS AND FUNCTIONS: Arithmetic and geometric sequences. Function tables, graphs, rules and equations.

ALGEBRA: Variable, expression, equation, evaluate algebraic expression. Formal and informal methods to solve equations and multi-step equations with addition, subtraction, multiplication and division. Positive integer exponents. Solve inequalities with addition and subtraction. Graphing linear equations and inequalities.

GEOMETRY: Constructions of congruent segments and angles, segment and angles bisectors. Measuring segments, perimeter, parallel lines, skew lines, transversal lines, perpendicular lines. Classify and measure angles and polygons. Congruent figures, angles of polygons, tessellations. Area of a rectangle, parallelogram, triangle, rhombus, trapezoid, regular polygons and circles. Classify triangles, sum of its angles, congruent triangles, and similar triangles. Angles in quadrilaterals, rectangles, squares, rhombi, and trapezoids. Similarity and proportion of corresponding parts, similar figures, scale drawings. Circumference and area of a circle, radius, diameter, center. Identify and draw three dimensional figures and their nets. Surface area and volume of prisms and cylinders. Coordinate plane, graphing ordered pairs, transformations, translation, reflections, symmetry.

MEASUREMENTS: Usage and conversion of metric system, customary system, time, and nonstandard units. Comparing and estimating measurements.

DATA ANALYSIS, STATISTICS, AND PROBABILITY: Frequency tables, sample and surveys, using a graph to solve problems. Construction and interpreting bar graphs, circle graphs, line graphs, stem-and-leaf plots, box-and-whisker plots, histograms, compare data sets. Interpreting data using the mean, median, mode, range, quartiles and interquartiles range. Misleading graph and statistics, making predictions from a sample and a graph. Probability of simple events, outcomes and sample space, complementary events, independent events, odds, experimental and theoretical probability, tree diagram, permutations and combinations, probability and ratio, geometric probability, bias and random sample.

PROBLEM SOLVING: 4 step approach, common strategies such as: using a table or an organized list, making a drawing, making an equation, trying a simpler problem, etc.

Course 2: Glencoe: *Mathematics Applications and Concepts - Book 2* and

Creative Publications: *The Problem Solver 7*

In addition to review and reinforcement of topics learned in Course 1, new concepts and skills include:

NUMBERS AND OPERATIONS : Ratios, scale factor, dimensional analysis, common ratio, geometric sequence.

Proportions and indirect measurement. Percent one number is of another, percent change, percent proportion, percent equation. Whole Numbers, factorials, perfect squares and roots. Properties and usage of negative-integer exponents. Identify and simplify rational numbers, rational numbers and decimals, compare and order rational numbers, graph rational numbers on a number line. Usage of scientific notation. Identify irrational numbers. Identify, and classify real numbers. Properties of equality, multiplicative inverse, closure rational numbers. Estimation of the square roots.

PATTERNS AND FUNCTIONS: Arithmetic, geometric, and Fibonacci sequences, and Pascal's triangle. Domain and range in a function. Definition of slope.

ALGEBRA: Writing algebraic expressions and equations, multiple representations of expressions. Solving multiplication, division, and multi-step inequality. Graphing linear equations and finding the slope of a line.

GEOMETRY: Construction of parallel and perpendicular lines. Square root and area of squares. Properties of isosceles triangles, right triangles. Pythagorean Theorem. Similar polygons. Relating surface area and volume. Lines and coordinate geometry, model transformation, dilations. Inductive and deductive reasoning.

DATA ANALYSIS, STATISTICS, AND PROBABILITY: Graphing line plots, and scatter plots, interpreting outliers, probability with dependent events and mutually exclusive or inclusive events, fundamental counting principle, fair and unfair games.

PROBLEM SOLVING: 4 step approach, common strategies such as using a table or an organized list, making a drawing, making an equation, trying a simpler problem, looking for a pattern, guess and check, working backwards, using logical reasoning, brainstorming; permutations and combinations.

TECHNOLOGY: Using calculators to explore scientific notation; using spreadsheet software to represent functions and program mathematical equations.

Course 3: Glencoe: *Mathematics Applications and Concepts - Book 3* and

Creative Publications: *The Problem Solver 7*

In addition to review and reinforcement of topics learned in Course 1 and 2, new concepts and skills include:

NUMBERS AND OPERATIONS : Graph irrational numbers. Add, subtract, multiply and divide rational numbers. Graph real numbers. Properties of inequalities.

PATTERNS AND FUNCTIONS: Arithmetic and geometric sequences, Fibonacci sequence. Functions and relations, dependent and independent variables, $f(x)$ notation, graphing linear functions, intercepts, graphing quadratic functions.

ALGEBRA: Write and solve equations and expressions, negative integer exponents, properties of exponents (power). Model monomials, constants, coefficients, like terms, multiply and divide monomials, simplify polynomial expressions, add and subtract polynomials, multiply polynomials by monomials. Solve equations with variables on both sides. Write and solve inequalities. Find intercepts from a linear equation, graph linear equations with calculator, graph linear inequalities, system of linear equations, solve systems by graphing and by substitution. Definition of quadratic and polynomial equations, families of quadratic graphs, graph quadratic equations, parabolas, simplifying radical expressions.

GEOMETRY: Construction of congruent triangles. Right triangles and trigonometry: sine, cosine, tangent ratios, trigonometry ratios in right triangles, angle of elevation and depression. Similarity and proportion using the golden rectangle. Circles, arcs and chords. Cross sections of solids. Surface area and volume of pyramids, cones, spheres. Slope-intercept form of lines, slope of parallel and perpendicular lines, fitted lines and scatter plots.

DATA ANALYSIS, STATISTICS, AND PROBABILITY: Analysis of positive, negative and no correlation. Fitted line, prediction equation. Interpreting outliers.

PROBLEM SOLVING: 4 step approach, common strategies such as using a table or an organized list, making a drawing, making an equation, trying a simpler problem, looking for a pattern, guess and check, working backwards, using logical reasoning, brainstorming; permutations and combinations.

TECHNOLOGY: Using graphing calculators to generate data, explore functions (including exponential models like compound interest), equations and graphs; using spreadsheet software to represent functions and program mathematical equations, and to create plots and fitted lines of data.

Concepts and skills include:

NUMBERS AND OPERATIONS: Integers, absolute value. Addition, subtraction, multiplication and division of integers. Factors, GCF, prime factorization. Scientific notation. Fractions, decimals and percents. Identify and classify rational numbers. Multiply and divide rational numbers. Addition and subtraction of like fractions. LCM and addition and subtraction of unlike fractions. Ratios, rates, and unit rate. Usage of proportion, percent proportions in real world problems. Percent equations. Percent change, increase or decrease. Rate of change. Find squares and square roots. Estimate square roots. Real number system.

PATTERNS AND FUNCTIONS: Arithmetic and geometric sequences.

ALGEBRA: Evaluate expressions containing numbers and variables. Solving equations with variables. Properties of addition and subtraction. Translate verbal phrases into numerical or algebraic expressions. Simplify algebraic expressions. Distributive property. Properties of equality. Solving and writing two-step equation. Simplify algebraic fractions. Multiplication and division of monomials. Write and evaluate expressions with positive and negative exponents. Solving equations with rational numbers. Solving equations with variables on both sides, using grouping symbols. Write and graph inequalities. Solve inequalities by addition, subtraction, multiplication, and division. Multi-step inequalities. Functions. Linear equations with two variables. Find x- and y- intercept, slope and rate of change. Slope-intercept form. Best fit line. Solving system of equations. Solutions of linear inequalities. Addition and subtraction of polynomials. Multiplying a polynomial by a monomial. Linear and nonlinear functions.

GEOMETRY: Scale drawings and models. Ordered pairs and relations. Construction and interpretation of scatter plots. Graphing linear equations using ordered pairs, using x- and y- intercepts, and using slope and y-intercept. Graphing inequalities. Measure, draw and classify angles. Classify triangles by angles, find the missing angle in a triangle. Distance and midpoint formulas of a line segment in a coordinate plane. Similar triangles and indirect measurements. Line and angle relationships. Congruent triangles. Transformation on the coordinate plane. Classification of quadrilaterals and their angles. Area of parallelograms, triangles and trapezoids. Classification of polygons and their interior and exterior angles. Circumference and area of circles. Area of irregular figures. Three dimensional figures. Volume and surface area of prisms, cylinders, pyramids and cones. Graphing quadratic and cubic functions.

TRIGONOMETRY: Pythagorean Theorem. Sine, cosine, and tangent ratios. Solve problems using trigonometry.

MEASUREMENTS: Use dimensional analysis to solve problems. Precision and significant digits.

DATA ANALYSIS, STATISTICS, AND PROBABILITY: Coordinate system. Scatter plots. Graphing algebraic relationships. Measures of central tendency: mean, median, mode. Probability of simple event and prediction of a larger group. Stem-and-leaf plots, box-and-whisker plots, histograms. Measures of variation. Misleading statistics. Counting outcomes with a tree diagram or the fundamental counting principal. Permutations and combinations. Odds of a simple event. Probability of independent, dependent and mutually exclusive events.

PROBLEM SOLVING: 4 step approach, common strategies such as using a table or an organized list, making a drawing, making an equation, trying a simpler problem, looking for a pattern, guess and check, working backwards, using logical reasoning, brainstorming; permutations and combinations.

TECHNOLOGY: Using graphing calculators to generate data, explore functions (including exponential models like compound interest), equations and graphs; using spreadsheet software to represent functions and program mathematical equations, and to create plots and fitted lines of data.

Algebra 1: Addison Wesley: *Algebra 1* by Foerster

This course offers students a formal approach to Algebra. Students will be required to use algebraic reasoning to support their answer to given problems. The course exposes the student to the application of Algebra to other disciplines in mathematics, science and the social sciences.

Concepts and skills include:

CONNECTIONS TO ALGEBRA: variables; exponents and powers; order of operations; equations and inequalities; tables and graphs; intro to functions.

PROPERTIES OF REAL NUMBERS: the real number line; addition, subtraction, multiplication and division of real numbers; the distributive property; probability and odds.

SOLVING LINEAR EQUATIONS: solving equations using addition, subtraction, multiplication and division; solving multi-step equations; solving equations with variables on both sides; solving decimal equations; formulas and functions; rates, ratios, and percents; linear equations and problem solving.

GRAPHING LINEAR EQUATIONS AND FUNCTIONS: coordinates and scatter plots; graphing linear equations; slope-intercept; solving linear equations using graphs; functions and relations.

WRITING LINEAR EQUATIONS: solving one-step and multi-step equations; solving compound inequalities; solving absolute value equations and inequalities; graphing linear inequalities with two variables; stem-and-leaf plots; mean, median and mode; and box-and-whisker plots.

SYSTEMS OF LINEAR EQUATIONS AND INEQUALITIES: solving linear systems by graphing, substitution, and linear combinations; applications of linear systems; special types of linear systems; solving systems of linear inequalities.

EXPONENTS AND EXPONENTIAL FUNCTIONS: multiplication properties of exponents; zero and negative exponents; division properties of exponents; scientific notation; exponential growth functions; exponential decay functions.

QUADRATIC EQUATIONS AND FUNCTIONS: solving quadratic equations by finding square roots; simplifying radicals; graphing quadratic functions; solving quadratic equations by graphing; solving quadratic equations by the quadratic formula; applications of the discriminant; graphing quadratic inequalities; comparing linear, exponential and quadratic models.

POLYNOMIALS AND FACTORING: adding, subtracting and multiplying polynomials; special products of polynomials; solving polynomial equations in factored form; factoring $ax^2 + bx + c$; factoring using the distributive property.

RATIONAL EQUATIONS AND FUNCTIONS: ratio and proportion; percents; direct and inverse variation; simplifying rational expressions; multiplying and dividing rational expressions; adding and subtracting rational expressions; dividing polynomials; rational equations and functions.

RADICALS AND CONNECTIONS TO GEOMETRY: functions involving square roots; operations with radical expressions; solving radical equations; completing the square; the Pythagorean Theorem and its converse; the distance and midpoint formulas; trigonometric ratios; logical reasoning: The Proof.