Glencoe Correlation

Geometry: Concepts and Applications
to New York Math A Core Curriculum

The seven key ideas below are based on the *Learning Standards for Mathematics, Science, and Technology* (MST), Standard 3: Mathematics.

Key Idea 1
Mathematical Reasoning

Students use mathematical reasoning to analyze mathematical situations, make conjectures, gather evidence, and construct an argument. (MST)

Performance Indicators	Key	Lessons
1A. Construct valid arguments.	• Truth value of compound sentences (conjunction, disjunction, conditional, related conditionals such as converse, inverse, and contrapositive, and biconditional). • Truth value of simple sentences (closed sentences, open sentences with replacement set and solution set, negations).	1-4, 15-1, 15-2, 15-3, 15-4, 15-5
1B. Follow and judge the validity of arguments.	• Truth value of compound sentences.	15-1, 15-2, 15-3, 15-4, 15-5

Key Idea 2
Number and Numeration

Students use number sense and numeration to develop an understanding of the multiple uses of numbers in the real world, the use of numbers to communicate mathematically, and the use of numbers in the development of mathematical ideas. (MST)

Performance Indicators	Key	Lessons
2A. Understand and use rational and irrational numbers.	• Real numbers including irrational numbers such as non-repeating decimals, irrational roots, and pi.	2-2, 7-1, 7-3, 11-5, 13-1
2B. Recognize the order of real numbers.	• Rational approximations of irrational numbers.	13-1
2C. Apply the properties of real numbers to various subsets of numbers.	• Properties of real numbers including closure, commutative, associative, and distributive properties, and inverse and identity elements.	

Key Idea 3
Operations

Students use mathematical operations and relationships among them to understand mathematics. (MST)

Performance Indicators	Key	Lessons
3A. Use addition, subtraction, multiplication, division, and exponentiation with real numbers and algebraic expressions.	• Signed numbers. • Use of variables: order of operations and evaluating algebraic expressions and formulas. • Addition and subtraction of polynomials: combining like terms and fractions with like denominators.	13-1

3A. *(continued)*	• Multiplication of polynomials: powers, products of monomials and binomials, equivalent fractions with unlike denominators, and multiplication of fractions. • Simplification of algebraic expressions. • Division of polynomials by monomials. • Operations with radicals: simplification, multiplication and division, and addition and subtraction. • Scientific notation. • Simplification of fractions. • Division of fractions. • Prime factorization. • Factoring: common monomials, binomial factors of trinomials. • Difference of two squares.	
3B. Use integral exponents on integers and algebraic expressions.	• Powers: positive, zero, and negative exponents.	
3C. Recognize and identify symmetry and transformations on figures.	• Intuitive notions of line reflection, translation, rotation, and dilation. • Line and point symmetry.	5-3, 10-6, 16-3, 16-4, 16-5, 16-6
3D. Use field properties to justify mathematical procedures.	• Distributive and associative field properties as related to the solution of quadratic equations. • Distributive field property as related to factoring.	

Key Idea 4
Modeling/Multiple Representation

Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships. (MST)

Performance Indicators	Key	Lessons
4A. Represent problem situations symbolically by using algebraic expressions, sequences, tree diagrams, geometric figures, and graphs.	• Use of variables/Algebraic representations. • Inequalities. • Formulas and literal equations. • Undefined terms: *point, line,* and *plane.* • Parallel and intersecting lines and perpendicular lines. • Angles: degree measure, right, acute, obtuse, straight, supplementary, complementary, vertical, alternate interior and exteriors, and corresponding. • Simple closed curves: polygons and circles. • Sum of interior and exterior angles of a polygon. • Study of triangles: classifications of scalene, isosceles, equilateral, acute, obtuse, and right; triangular inequality; sum of the measures of angles of a triangle; exterior angle of a triangle, base angles of an isosceles triangle. • Study of quadrilaterals: classification and properties of parallelograms, rectangles, rhombi, squares, and trapezoids. • Study of solids: classification of prism, rectangular solid, pyramid, right circular cylinder, cone, and sphere.	1-2, 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 4-1, 4-2, 4-3, 4-4, 4-5, 5-1, 5-2, 6-4, 7-2, 7-3, 7-4, 8-1, 8-2, 8-3, 8-4, 8-5, 9-4, 10-1, 10-2, 11-1, 12-1,12-2, 12-4,12-6

4A. *(continued)*	• Sample spaces: list of ordered pairs of n-tuples, tree diagrams.	
4B. Justify the procedures for basic geometric constructions.	• Basic constructions: copy line and angle, bisect line segment and angle, perpendicular lines and parallel lines. • Comparison of triangles: congruence and similarity.	1-5, 2-3, 3-2, 3-3, 3-7, 4-4, Inv 5, 5-5, 5-6, 6-1, 6-2, Inv 6, 9-3, Inv 9
4C. Use transformations in the coordinate plane.	• Reflection in a line and in a point. • Translations. • Dilations.	16-3, 16-4, 16-5, 16-6
4D. Develop and apply the concept of basic loci to compound loci.	• Locus. • At a fixed distance from a point. • At a fixed distance from a line. • Equidistant from two points. • Equidistant from two parallel lines. • Equidistant from two intersecting lines. • Compound locus.	Inv 11
4E. Model real-world problems with systems of equations and inequalities.	• Systems of linear equations and inequalities.	16-1, 16-2

Key Idea 5
Measurement

Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data. (MST)

Performance Indicators	Key	Lessons
5A. Apply formulas to find measures such as length, area, volume, weight, time, and angle in real-world contexts.	• Perimeter of polygons and circumference of circles. • Area of polygons and circles. • Volume of solids. • Pythagorean theorem.	1-6, 4-5, 6-6, 10-3, 10-4, 10-5, 11-5, 11-6, 12-3, 12-5, 12-6, 12-7
5B. Choose and apply appropriate units and tools in measurement situations.	• Converting to equivalent measurements within metric and English measurement systems. • Direct and indirect measure.	2-2, 3-2, 13-4, Inv 13, 13-5
5C. Use dimensional analysis techniques.	• Dimensional analysis.	
5D. Use statistical methods including the measures of central tendency to describe and compare data.	• Collecting and organizing data: sampling, tally, chart, frequency table, circle graphs, broken line graphs, frequency histogram, box and whisker plots, scatter plots, stem and leaf plots, and cumulative frequency histogram. • Measures of central tendency: mean, median, mode. • Quartiles and percentiles.	1-3, 1-6, 3-1, 3-4, 7-4, 8-5, 9-5, 10-7
5E. Use trigonometry as a method to measure indirectly.	• Right triangle trigonometry.	13-4, Inv 13, 13-5

5F. Apply proportions to scale drawings and direct variation.	• Ratio. • Proportion. • Scale drawings. • Percent. • Similar figures. • Similar polygons: ratio of perimeters and areas. • Direct variation.	2-1, 7-2, 7-3, 7-4, 9-2, 9-3, 9-6, 9-7, Inv 10
5G. Relate absolute value, distance between two points, and the slope of a line to the coordinate plane.	• Absolute value and length of a line segment. • Midpoint of a segment. • Equation of a line: point-slope and slope intercept form. • Comparison of parallel and perpendicular lines.	2-2, 2-5, 4-6, 4-7
5H. Explain the role of error in measurement and its consequence on subsequent calculations.	• Error of measurement and its consequences on calculation of perimeter of polygons and circumference of circles. • Area of polygons and circles. • Volume of solids. • Percent of error in measurements.	2-2, 10-3, 10-4, 10-5, 11-6, 12-3, 12-5, 12-6
5I. Use geometric relationships in relevant measurement problems involving geometric concepts.	• Similar polygons: ratio of perimeters and areas. • Similar figures. • Comparison of volumes of similar solids.	9-2, 9-7, Inv 10, 12-7

Key Idea 6
Uncertainty

Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.(MST)

Performance Indicators	Key	Lessons
6A. Judge the reasonableness of results obtained from applications in algebra, geometry, trigonometry, probability, and statistics.	• Theoretical versus empirical probability.	
6B. Use experimental and theoretical probability to represent and solve problems involving uncertainty.	• Single and compound events. • Problems involving *and* and *or.* • Probability of the complement of an event.	11-6
6C. Use the concept of random variable in computing probabilities.	• Mutually exclusive and independent events. • Counting principle. • Sample space. • Probability distribution. • Probability of the complement of an event.	
6D. Determine probabilities, using permutations and combinations.	• Factorial notation. • Permutations: nPn and nPr. • Combinations: nCn and nCr.	

Key Idea 7 Patterns/Functions Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently. (MST)		
Performance Indicators	**Key**	**Lessons**
7A. Represent and analyze functions, using verbal descriptions, tables, equations, and graphs.	• Techniques for solving equations and inequalities. • Techniques for solving factorable quadratic equations. • Graphs of linear relations: slope and intercept. • Graphs of conics: circle and parabola. • Graphic solution of systems of linear equations, inequalities, and quadratic-linear pair. • Algebraic solution of systems of linear equations, inequalities, and quadratic-linear pair by substitution method and addition-subtraction method.	4-5, 4-6, 14-6, 16-1, 16-2
7B. Apply linear and quadratic functions in the solution of problems.	• Graphic and algebraic solutions of linear and quadratic functions in the solution of problems.	
7C. Translate among the verbal descriptions, tables, equations, and graphic forms of functions.	• Translate linear and quadratic functions, systems of equations, inequalities, and quadratic linear pairs between representations that are verbal descriptions, tables, equations, or graphs.	
7D. Model real-world situations with the appropriate function.	• Determine and model real-life situations with appropriate functions.	
7E. Apply axiomatic structure to algebra.	• Solve linear equations with integral, fraction, or decimal coefficients. • Solve linear inequalities. • Solve factorable quadratic equations. • Solve systems of linear equations, inequalities, and quadratic-linear pair.	16-1, 16-2