Virginia's College and Career Ready *Mathematics Performance Expectations* Correlation with Virginia's 2009 *Mathematics Standards of Learning*

October 2011

Virginia's Mathematics Performance Expectation	Virginia's Standards of Learning
MPE.1 Solve practical problems involving rational numbers (including numbers in scientific notation), percents, ratios, and proportions.	**Grade 8.3, Grade 8.1b**
MPE.2 Collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.	**Algebra II.9**
MPE.3 Use pictorial representations, including computer software, constructions, and coordinate methods, to solve problems involving symmetry and transformation. This will include **a) investigating and using formulas for finding distance, midpoint, and slope;** **b) applying slope to verify and determine whether lines are parallel or perpendicular;** **c) investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and** **d) determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.**	**Geometry.3**
MPE.4 Verify characteristics of quadrilaterals and use properties of quadrilaterals to solve real-world problems.	**Geometry.9**
MPE.5 Solve real-world problems involving right triangles by using the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry.	**Geometry.8**
MPE.6 Use formulas for surface area and volume of three-dimensional objects to solve real-world problems.	**Geometry.13**
MPE.7 Use similar geometric objects in two- or three-dimensions to **a) compare ratios between side lengths, perimeters, areas, and volumes;** **b) determine how changes in one or more dimensions of an object affect area and/or volume of the object;** **c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and** **d) solve real-world problems about similar geometric objects.**	**Geometry.14**
MPE.8 Compare distributions of two or more univariate data sets, analyzing center and spread (within group and between group variations), clusters and gaps, shapes, outliers, or other unusual features.	**Probability and Statistics.3**
MPE.9 Design and conduct an experiment/survey. Key concepts include **a) sample size;** **b) sampling technique;** **c) controlling sources of bias and experimental error;** **d) data collection; and** **e) data analysis and reporting.**	**Algebra, Functions, and Data Analysis.8**
MPE.10 Investigate and apply the properties of arithmetic and geometric sequences and series to solve real-world problems, including writing the first n terms, finding the nth term, and evaluating summation formulas. Notation will include Σ and a_n.	**Algebra II.2**

Virginia's Mathematics Performance Expectation	Virginia's Standards of Learning
MPE.11 Use angles, arcs, chords, tangents, and secants to **a) investigate, verify, and apply properties of circles;** **b) solve real-world problems involving properties of circles; and** **c) find arc lengths and areas of sectors in circles.**	Geometry.11
MPE.12 Transfer between and analyze multiple representations of functions, including algebraic formulas, graphs, tables, and words. Select and use appropriate representations for analysis, interpretation, and prediction.	Algebra, Functions, and Data Analysis.4
MPE.13 Investigate and describe the relationships among solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression.	Algebra II.8
MPE.14 Recognize the general shape of function (absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic) families and convert between graphic and symbolic forms of functions. Use a transformational approach to graphing. Use graphing calculators as a tool to investigate the shapes and behaviors of these functions.	Algebra II.6
MPE.15 Use knowledge of transformations to write an equation, given the graph of a function (linear, quadratic, exponential, and logarithmic).	Algebra, Functions, and Data Analysis.2
MPE.16 Investigate and analyze functions (linear, quadratic, exponential, and logarithmic families) algebraically and graphically. Key concepts include **a) continuity; (Algebra, Functions, and Data Analysis.1)** **b) local and absolute maxima and minima; (Algebra, Functions, and Data Analysis.1)** **c) domain and range, including limited and discontinuous domains and ranges; (Algebra II.7)** **d) zeros; (Algebra II.7)** **e) x- and y-intercepts; (Algebra II.7)** **f) intervals in which a function is increasing or decreasing; (Algebra II.7)** **g) asymptotes; (Algebra II.7)** **h) end behavior; (Algebra II.7)** **i) inverse of a function; (Algebra II.7)** **j) composition of multiple functions; (Algebra II.7)** **k) finding the values of a function for elements in its domain; (Algebra I.7) and** **l) making connections between and among multiple representations of functions including concrete, verbal, numeric, graphic, and algebraic. (Algebra I.7)**	Algebra II.7, Algebra, Functions, and Data Analysis.1, Algebra I.7
MPE.17 Determine optimal values in problem situations by identifying constraints and using linear programming techniques.	Algebra, Functions, and Data Analysis.5
MPE.18 Given rational, radical, or polynomial expressions, **a) add, subtract, multiply, divide, and simplify rational algebraic expressions;** **b) add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents;** **c) write radical expressions as expressions containing rational exponents and vice versa; and** **d) factor polynomials completely.**	Algebra II.1

Virginia's Mathematics Performance Expectation	Virginia's Standards of Learning
MPE.19 Graph linear equations and linear inequalities in two variables, including **a) determining the slope of a line when given an equation of the line, the graph of the line, or two points on the line; describing slope as rate of change and determine if it is positive, negative, zero, or undefined; and** **b) writing the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.**	**Algebra I.6**
MPE.20 Given a point other than the origin on the terminal side of an angle, use the definitions of the six trigonometric functions to find the sine, cosine, tangent, cotangent, secant, and cosecant of the angle in standard position. Relate trigonometric functions defined on the unit circle to trigonometric functions defined in right triangles.	**Trigonometry.1**
MPE.21 Given the coordinates of the center of a circle and a point on the circle, write the equation of the circle.	**Geometry.12**
MPE.22 Analyze graphical displays of univariate data, including dotplots, stemplots, and histograms, to identify and describe patterns and departures from patterns, using central tendency, spread, clusters, gaps, and outliers. Use appropriate technology to create graphical displays.	**Probability and Statistics.1**
MPE.23 Analyze the normal distribution. Key concepts include **a) characteristics of normally distributed data;** **b) percentiles;** **c) normalizing data, using z-scores; and** **d) area under the standard normal curve and probability.**	**Algebra, Functions, and Data Analysis.7**
MPE.24 Describe orally and in writing the relationships between the subsets of the real number system.	**Grade 8.2**
MPE.25 Perform operations on complex numbers, express the results in simplest form using patterns of the powers of *i*, and identify field properties that are valid for the complex numbers.	**Algebra II.3**
MPE.26 Solve, algebraically and graphically, **a) absolute value equations and inequalities;** **b) quadratic equations over the set of complex numbers;** **c) equations containing rational algebraic expressions; and** **d) equations containing radical expressions.** **Use graphing calculators for solving and for confirming the algebraic solutions.**	**Algebra II.4**
MPE.27 Given one of the six trigonometric functions in standard form, **a) state the domain and the range of the function;** **b) determine the amplitude, period, phase shift, vertical shift, and asymptotes;** **c) sketch the graph of the function by using transformations for at least a two-period interval; and** **d) investigate the effect of changing the parameters in a trigonometric function on the graph of the function.**	**Trigonometry.6**
MPE.28 Find, without the aid of a calculator, the values of the trigonometric functions of the special angles and their related angles as found in the unit circle. This includes converting angle measures from radians to degrees and vice versa.	**Trigonometry.3**

Virginia's Mathematics Performance Expectation	Virginia's Standards of Learning
MPE.29 Investigate and identify the characteristics of conic section equations in (*h, k*) and standard forms. Use transformations in the coordinate plane to graph conic sections.	Mathematical Analysis.8
MPE.30 Using two-way tables, analyze categorical data to describe patterns and departure from patterns and to find marginal frequency and relative frequencies, including conditional frequencies.	Probability and Statistics.7
MPE.31 Calculate probabilities. Key concepts include a) conditional probability; b) dependent and independent events; c) addition and multiplication rules; d) counting techniques (permutations and combinations); and e) Law of Large Numbers.	Algebra, Functions, and Data Analysis.6
MPE.32 Use the relationships between angles formed by two lines cut by a transversal to a) determine whether two lines are parallel; b) verify the parallelism, using algebraic and coordinate methods as well as deductive proofs; and c) solve real-world problems involving angles formed when parallel lines are cut by a transversal.	Geometry.2
MPE.33 Given information in the form of a figure or statement, prove two triangles are congruent, using algebraic and coordinate methods as well as deductive proofs.	Geometry.6
MPE.34 Given information in the form of a figure or statement, prove two triangles are similar, using algebraic and coordinate methods as well as deductive proofs.	Geometry.7
MPE.35 Construct and justify the constructions of a) a line segment congruent to a given line segment; b) the perpendicular bisector of a line segment; c) a perpendicular to a given line from a point not on the line; d) a perpendicular to a given line at a given point on the line; e) the bisector of a given angle; f) an angle congruent to a given angle; and g) a line parallel to a given line through a point not on the given line.	Geometry.4
MPE.36 Verify basic trigonometric identities and make substitutions, using the basic identities.	Trigonometry.5