MISSOURI MATHEMATICS CORE ACADEMIC STANDARDS CROSSWALK TO MISSOURI GLES/CLES
CONTENT ALIGNMENTS AND SHIFTS – Grade 8 *DRAFT*

Grade 8	
Critical Areas In Grade 8, instructional time should focus on three critical areas: 1. Formulating and reasoning about expressions and equations, including modeling an association of bivariate data with a linear equation, and solving linear equations; 2. Grasping the concept of function and using functions to describe quantitative relationships; and 3. Analyzing two- and three-dimensional space and figures space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.	**Mathematical Practices** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

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The Number Systems 8.NS			
Know that there are numbers that are not rational, and approximate them by rational numbers.			
8.NS.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. http://illustrativemathematics.org/illustrations/338 http://illustrativemathematics.org/illustrations/395 http://illustrativemathematics.org/illustrations/334	**N1B8** ***use fractions, decimals***, and percents ***to solve problems***	**N1B7** ***recognize and generate equivalent forms of fractions, decimals*** and percents

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8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* http://illustrativemathematics.org/illustrations/338 http://illustrativemathematics.org/illustrations/336 http://illustrativemathematics.org/illustrations/337		**N1AA1** ***compare and order rational and irrational numbers, including finding their approximate locations on a number line*** **N2D7** ****approximate the value of square roots to the nearest whole number***
Expressions and Equations 8.EE			
Work with radicals and integer exponents.			
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* http://illustrativemathematics.org/illustrations/395	**N2C8** ***apply properties of operations to all rational numbers including order of operations and inverse operations***	**N1C7** ****recognize equivalent representations for the same number and generate them by decomposing and composing numbers including exponential notation*** **A2BA1** describe and ***use algebraic manipulations***, including factoring ***and rules of integer exponents and apply properties of exponents (including order of operations)to simplify expressions***
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. **Know that √2 is irrational.**		**N2D6** ***identify square and cubic numbers and determine whole number roots and cubes*** **N2D7** ****approximate the value of square roots to the nearest whole number***

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8.EE.3	Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger.* http://illustrativemathematics.org/illustrations/476	**N1C8** ****recognize equivalent representations for the same number and generate them by decomposing and composing numbers, including scientific notation***	
8.EE.4	**Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.** Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. http://illustrativemathematics.org/illustrations/113	**N1C8** ****recognize equivalent representations for the same number and generate them by decomposing and composing numbers, including scientific notation***	
Understand the connections between proportional relationships, lines, and linear equations.			

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8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* http://illustrativemathematics.org/illustrations/136 http://illustrativemathematics.org/illustrations/352 http://illustrativemathematics.org/illustrations/471 http://illustrativemathematics.org/illustrations/129 http://illustrativemathematics.org/illustrations/57 http://illustrativemathematics.org/illustrations/55 http://illustrativemathematics.org/illustrations/86 http://illustrativemathematics.org/illustrations/184		**A1C8** ***compare and contrast various forms of representations of patterns*** **A4A8** ***analyze the nature of changes (including slope and intercepts) in quantities in linear relationships***	
8.EE.6	**Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation *y = mx* for a line through the origin and the equation *y = mx + b* for a line intercepting the vertical axis at *b*.** http://illustrativemathematics.org/illustrations/136 http://illustrativemathematics.org/illustrations/352 http://illustrativemathematics.org/illustrations/471		**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships***	
Analyze and solve linear equations and pairs of simultaneous linear equations.			
8.EE.7	Solve linear equations in one variable. http://illustrativemathematics.org/illustrations/583 http://illustrativemathematics.org/illustrations/352 http://illustrativemathematics.org/illustrations/550		

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8.EE.7.a	**Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x = a, a = a, or a = b* results (where *a* and *b* are different numbers).**		
8.EE.7.b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships*** **A2B8** ***use properties to generate equivalent forms for simple algebraic expressions that include all rationals***	
8.EE.8	Analyze and solve pairs of simultaneous linear equations. http://illustrativemathematics.org/illustrations/469 http://illustrativemathematics.org/illustrations/472 http://illustrativemathematics.org/illustrations/554 http://illustrativemathematics.org/illustrations/73		
8.EE.8.a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	**G4B8** ***draw or use visual models to represent and solve problems***	**A2DA1** ***use and solve systems of linear equations*** or inequalities ***with 2 variables***
8.EE.8.b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*	**G4B8** ***draw or use visual models to represent and solve problems***	**A2DA1** ***use and solve systems of linear equations*** or inequalities ***with 2 variables***

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8.EE.8.c	Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships*** **G4B8** ***draw or use visual models to represent and solve problems***	**A2DA1** ***use and solve systems of linear equations*** or inequalities ***with 2 variables***
Functions 8.F			
Define, evaluate, and compare functions.			
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.[1] (Function notation is not required in Grade 8.)	**A1D8** ***identify functions*** as linear or nonlinear ***from tables, graphs or equations***	
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.* http://illustrativemathematics.org/illustrations/641	**A1C8** ***compare and contrast various forms of representations of patterns***	
8.F.3	Interpret the equation *y = mx + b* as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*	**A1D8** ***identify functions as linear or nonlinear from tables, graphs or equations***	
Use functions to model relationships between quantities.			

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8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. http://illustrativemathematics.org/illustrations/417 http://illustrativemathematics.org/illustrations/552 http://illustrativemathematics.org/illustrations/477 http://illustrativemathematics.org/illustrations/584 http://illustrativemathematics.org/illustrations/383 http://illustrativemathematics.org/illustrations/247 http://illustrativemathematics.org/illustrations/120	**A1B8** ***generalize patterns represented graphically or numerically with words or symbolic rules, using explicit notation*** **A4A8** ***analyze the nature of changes (including slope and intercepts) in quantities in linear relationships***	
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. http://illustrativemathematics.org/illustrations/417 http://illustrativemathematics.org/illustrations/633 http://illustrativemathematics.org/illustrations/628 http://illustrativemathematics.org/illustrations/632	**A3A8** ***model and solve problems, using*** multiple representations such as ***graphs***, tables, and linear equations	
Geometry			
Understand congruence and similarity using physical models, transparencies, or geometry software.			
8.G.1	Verify experimentally the properties of rotations, reflections, and translations:		

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8.G.1.a	Lines are taken to lines, and line segments to line segments of the same length.	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation***	
8.G.1.b	Angles are taken to angles of the same measure.	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation***	
8.G.1.c	Parallel lines are taken to parallel lines.	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation***	
8.G.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. http://illustrativemathematics.org/illustrations/646	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation***	**G3A3** ***determine if two objects are congruent through a slide, flip, or turn***
8.G.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation*** **G3B8** ***describe the relationship between the scale factor and the area of the image using a dilation (stretching/shrinking)***	

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8.G.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	**G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation*** **G3B8** ***describe the relationship between the scale factor and the area of the image using a dilation (stretching/shrinking)***	**G1B7** ***describe relationships between corresponding sides, corresponding angles and corresponding perimeters of similar triangles***
8.G.5	**Use informal arguments to establish facts about the angle sum and exterior angle of triangles**, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* http://illustrativemathematics.org/illustrations/59 http://illustrativemathematics.org/illustrations/56	**M2B8** ***solve problems of angle measure, including those involving triangles and parallel lines cut by a transversal***	
Understand and apply the Pythagorean Theorem.			
8.G.6	**Explain a proof of the Pythagorean Theorem and its converse.**		
8.G.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. http://illustrativemathematics.org/illustrations/112	**G1A8** ****describe, classify and generalize relationships*** between and among types ***of a) 2-dimensional objects and b) 3-dimensional*** objects using their defining properties including Pythagorean Theorem	

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8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**G2A8** ***use coordinate geometry to analyze properties of right triangles and quadrilaterals (including the use of the Pythagorean Theorem***	
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.			
8.G.9	Know the formulas for the **volumes of cones**, cylinders, **and spheres** and use them to solve real-world and mathematical problems. http://illustrativemathematics.org/illustrations/520 http://illustrativemathematics.org/illustrations/517 http://illustrativemathematics.org/illustrations/112 http://illustrativemathematics.org/illustrations/521		**M2C7** ***solve problems involving*** circumference and/or area of a circle and surface area/***volume of*** a rectangular or triangular prism, or ***cylinder***
Statistics and Probability			
Investigate patterns of association on bivariate data.			
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. http://illustrativemathematics.org/illustrations/41	**D1C8** select, ***create and use*** appropriate ***graphical representations of data (including scatter plots)*** and box plots (box and whiskers) **D3A8** ***make conjectures about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data and the approximate lines of fit***	

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8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. http://illustrativemathematics.org/illustrations/41	**A1B8** ***generalize patterns represented graphically*** or numerically with words or symbolic rules, using explicit notation **D3A8** ***make conjectures about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data and the approximate lines of fit***	
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*	**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships*** **A4A8** ***analyze the nature of changes (including slope and intercepts) in quantities in linear relationships***	
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*	**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships*** **A4A8** ***analyze the nature of changes (including slope and intercepts) in quantities in linear relationships***	
Grade 8 GLEs not included in Grade 8 CAS			
N1A8 *compare and order all rational numbers including percents, and find their approximate location on a number line **G3C8** *identify the number of rotational symmetries of regular polygons **M2D8** analyze precision and accuracy in measurement situations and determine number of significant digits **D2A8** find, use and interpret measures of center, outliers and spread, including range and interquartile range **D2B8** compare different representations of the same data and evaluate how well each representation shows important aspects of the data			