MISSOURI MATHEMATICS CORE ACADEMIC STANDARDS CROSSWALK TO MISSOURI GLES/CLES
CONTENT ALIGNMENTS AND SHIFTS – Grade 6 *DRAFT*

Grade 6	
Critical Areas In Grade 6, instructional time should focus on four critical areas: 1. connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; 2. completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; 3. writing, interpreting, and using expressions and equations; developing understanding of statistical thinking; and 4. developing understanding of statistical thinking.	**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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Ratio and Proportional Relationships 6.RP			
Understand ratio concepts and use ratio reasoning to solve problems http://illustrativemathematics.org/illustrations/496 http://illustrativemathematics.org/illustrations/61 http://illustrativemathematics.org/illustrations/62 http://illustrativemathematics.org/illustrations/63 http://illustrativemathematics.org/illustrations/65			
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every two wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* http://illustrativemathematics.org/illustrations/76	**N3E6** ***solve problems using ratios and rates***	

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6.RP.2	Understand the concept of a unit rate $\frac{a}{b}$ associated with a ratio *a:b* with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $\frac{3}{4}$ cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Expectations for unit rates in this grade are limited to non-complex fractions.) http://illustrativemathematics.org/illustrations/77 http://illustrativemathematics.org/illustrations/549	**N3E6** ***solve problems using ratios and rates***	

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6.RP.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. http://illustrativemathematics.org/illustrations/135 http://illustrativemathematics.org/illustrations/498 http://illustrativemathematics.org/illustrations/79 http://illustrativemathematics.org/illustrations/134 http://illustrativemathematics.org/illustrations/118 http://illustrativemathematics.org/illustrations/132 http://illustrativemathematics.org/illustrations/137 http://illustrativemathematics.org/illustrations/131 http://illustrativemathematics.org/illustrations/53 http://illustrativemathematics.org/illustrations/193 http://illustrativemathematics.org/illustrations/115 http://illustrativemathematics.org/illustrations/54 http://illustrativemathematics.org/illustrations/66 http://illustrativemathematics.org/illustrations/67 http://illustrativemathematics.org/illustrations/68		
6.RP.3.a	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	**N3E6** ***solve problems using ratios and rates*** **A3A6** ***model and solve problems, using multiple representations such as tables, expressions and one-step-equations***	**N3E7** ***solve problems involving proportions, such as scaling and finding equivalent ratios*** **G2A7** ***use coordinate geometry*** to construct and identify geometric shapes in the coordinate plane using their properties

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6.RP.3.b	Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*	**N3E6** ***solve problems using ratios and rates***	
6.RP.3.c	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $\frac{30}{100}$ times the quantity); solve problems involving finding the whole, given a part and the percent.	**N3E6** ***solve problems using ratios and rates***	**N1B8** ***use*** fractions, decimals and ***percents to solve problems***
6.RP.3.d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	**N3E6** ***solve problems using ratios and rates*** **M2E6** ***convert from one unit to another within a system of measurement (mass and weight)***	**M2E5** ***convert from one unit to another within a system of linear measurement (customary and metric*****)** **M2E7** ***convert from one unit to another within a system of measurement (capacity*****)** and convert square or cubic units within the same system of measurement
The Number System 6.NS			
Apply and extend previous understandings of multiplication and division to divide fractions by fractions.			

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6.NS.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for* $\left(\frac{2}{3}\right) \div \left(\frac{3}{4}\right)$ *and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that* $\left(\frac{2}{3}\right) \div \left(\frac{3}{4}\right) = \frac{8}{9}$ *because* $\frac{3}{4}$ *of* $\frac{2}{3}$ *is* $\frac{8}{9}$*. (In general,* $\left(\frac{a}{b}\right) \div \left(\frac{c}{d}\right) = \frac{ad}{bc}$ *How much chocolate will each person get if 3 people share* $\frac{1}{2}$ *lb of chocolate equally? How many* $\frac{3}{4}$*-cup servings are in* $\frac{2}{3}$ *of a cup of yogurt? How wide is a rectangular strip of land with length* $\frac{3}{4}$ *mi and area* $\frac{1}{2}$ *square mi?* http://illustrativemathematics.org/illustrations/463 http://illustrativemathematics.org/illustrations/412 http://illustrativemathematics.org/illustrations/413 http://illustrativemathematics.org/illustrations/408 http://illustrativemathematics.org/illustrations/407 http://illustrativemathematics.org/illustrations/411 http://illustrativemathematics.org/illustrations/410 http://illustrativemathematics.org/illustrations/464 http://illustrativemathematics.org/illustrations/267	**N2B6** ***describe the effects of*** multiplication and ***division on fractions*** and decimals **N3C6** multiply and ***divide positive rational numbers*** **G4B6** ***draw or use visual models to represent and solve problems***	
Compute fluently with multi-digit numbers and find common factors and multiples.			

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6.NS.2	Fluently divide multi-digit numbers using the standard algorithm http://illustrativemathematics.org/illustrations/271 http://illustrativemathematics.org/illustrations/270	**N3C6** multiply and ***divide positive rational numbers***	**N3B5** ***demonstrate fluency with efficient procedures for*** adding and subtracting decimals and fractions (with unlike denominators) and ***division of whole numbers*** **N3C5** ***apply*** and describe ***the strategy used to compute a division problem*** up to a 3-digit by 2-digit and addition and subtraction of fractions and decimals
6.NS.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. http://illustrativemathematics.org/illustrations/274 http://illustrativemathematics.org/illustrations/374 http://illustrativemathematics.org/illustrations/273 http://illustrativemathematics.org/illustrations/272 http://illustrativemathematics.org/illustrations/275 http://illustrativemathematics.org/illustrations/305	**N3C6** ***multiply and divide positive rational numbers***	**N3B5** ***demonstrate fluency with efficient procedures for adding and subtracting decimals*** and fractions (with unlike denominators) and division of whole numbers **N3C5** ***apply*** and describe ***the strategy used to compute*** a division problem up to a 3-digit by 2-digit and ***addition and subtraction of*** fractions and ***decimals***

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6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* http://illustrativemathematics.org/illustrations/257 http://illustrativemathematics.org/illustrations/258 http://illustrativemathematics.org/illustrations/255 http://illustrativemathematics.org/illustrations/256 http://illustrativemathematics.org/illustrations/259	**A2B6** ***use the*** commutative, ***distributive*** and associative ***properties*** to generate equivalent forms for simple algebraic expressions	**N1D5** ****describe numbers according to their characteristics, including whole number common factors and multiples***, prime or composite and square numbers
Apply and extend previous understandings of numbers to the system of rational numbers.			
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. http://illustrativemathematics.org/illustrations/277 http://illustrativemathematics.org/illustrations/278		**N1A8** ****compare and order all rational numbers*** including percents, and find their location on a number line
6.NS.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.		

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6.NS.6.a	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.		**N1A8** ****compare and order all rational numbers*** including percents, and ***find their location on a number line***
6.NS.6.b	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	**G3A6** ****describe the transformations from a given pre-image using the terms reflection/flip***, rotation/turn, and translation/slide	**G2A7** ***use coordinate geometry to construct and identify geometric shapes in the coordinate plane using their properties*** **G3A8** ***reposition shapes under formal transformations such as reflection, rotation and translation***
6.NS.6.c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.		**N1A8** ****compare and order all rational numbers*** including percents, ***and find their location on a number line*** **G2A7** ***use coordinate geometry to construct and identify geometric shapes in the coordinate plane using their properties***
6.NS.7	Understand ordering and absolute value of rational numbers. http://illustrativemathematics.org/illustrations/288 http://illustrativemathematics.org/illustrations/286		
6.NS.7.a	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*		**N1A8** ****compare and order all rational numbers*** including percents, ***and find their location on a number line***

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6.NS.7.b	Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3° C > –7° C to express the fact that –3° C is warmer than –7°C.*		**N1A8** ****compare and order all rational numbers*** including percents, and find their location on a number line
6.NS.7.c	Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*		**N2C7** ***apply properties of operations (including order of operations) to positive rational numbers and integers***
6.NS.7.d	**Distinguish comparisons of absolute value from statements about order.** ***For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.***		
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	**G2A6** ***use coordinate systems to construct geometric shapes***	**G2A5** ****use coordinate systems to specify location, describe paths and find distance between points along horizontal and vertical lines*** **G2A7** ***use coordinate geometry*** to ***construct*** and identify ***geometric shapes in the coordinate plane*** using their properties
Expressions and Equations 6.EE			
Apply and extend previous understandings of arithmetic to algebraic expressions.			

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6.EE.1	Write and evaluate numerical expressions involving whole-number exponents. http://illustrativemathematics.org/illustrations/532	**A2B6** ***use the commutative, distributive and associative properties to generate equivalent forms for simple algebraic expressions*** **A3A6** ***model and solve problems, using multiple representations such as*** tables, ***expressions*** and one-step-equations **N2D6** identify square and cubic numbers and determine ***whole number roots and cubes***	
6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers. http://illustrativemathematics.org/illustrations/421 http://illustrativemathematics.org/illustrations/540		
6.EE.2.a	Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*	**A2A6** ***use symbolic algebra to represent unknown quantities in expressions*** or equations and solve one-step equations	
6.EE.2.b	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*		

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6.EE.2.c	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.*	**N2C6 ****apply properties of operations (including order of operations) to positive rational numbers***	**M2C7** ***solve problems involving*** circumference and/or area of a circle and ***surface area/volume*** of a rectangular or triangular prism or cylinder
6.EE.3	Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*	**N2C6 ****apply properties of operations (including order of operations) to positive rational numbers*** **A2B6** ***use the commutative, distributive and associative properties to generate equivalent forms for simple algebraic expressions***	
6.EE.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* http://illustrativemathematics.org/illustrations/542 http://illustrativemathematics.org/illustrations/461	**A2B6** ***use*** the commutative, distributive and associative ***properties to generate equivalent forms for simple algebraic expressions***	
Reason about and solve one-variable equations and inequalities. http://illustrativemathematics.org/illustrations/494			

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6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. http://illustrativemathematics.org/illustrations/673		**A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships***
6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. http://illustrativemathematics.org/illustrations/425	**A2A6** ***use symbolic algebra to represent unknown quantities in expressions*** or equations and solve one-step equations	
6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. http://illustrativemathematics.org/illustrations/425		**A2A7** ***use symbolic algebra to represent unknown quantities in*** *expressions or* ***equations and solve linear equations with one variable***
6.EE.8	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. http://illustrativemathematics.org/illustrations/642		
Represent and analyze quantitative relationships between dependent and independent variables.			

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6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express **one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable.** Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*	***A3A6 *construct and analyze representations to compare situations with constant or varying rates of change***	***A3A5 model problem situations and draw conclusions, using representations such as graphs, tables, or number sentences*** **A2A8** ***use symbolic algebra to represent and solve problems that involve linear relationships***
Geometry 6.G			
Solve real-world and mathematical problems involving area, surface area, and volume. http://illustrativemathematics.org/illustrations/545 http://illustrativemathematics.org/illustrations/135			
6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	**M2C6** ***solve problems involving the area*** or perimeter ***of polygons***	**G1C5** predict and ***justify the results of subdividing, combining and transforming shapes***

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6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. .		**M2C5** ***determine volume by finding the total number of the same size units needed to fill a space without gaps or overlaps*** **M2C7** ***solve problems involving*** circumference and/or area of a circle and surface area/***volume of a rectangular*** or triangular ***prism*** or cylinder
6.G.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. **Apply these techniques in the context of solving real-world and mathematical problems.**	**G2A6** ***use coordinate systems to construct geometric shapes***	**G2A5** ***use coordinate systems to*** specify location, describe paths and ***find distance between points along horizontal and vertical lines***
6.G.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	**G4B6** ***draw or use visual models to represent and solve problems***	**G4A5** ***given a net of a prism*** or cylinder, ***identify the 3-dimensional shape*** **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 6.SP			
Develop understanding of statistical variability.			

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6.SP.1	**Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.** *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	**D1A6** ***formulate questions*****,** design studies and collect data ***about a characteristic***	
6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.		**D2A7** ***find, use and interpret measures of center and spread, including range***
6.SP.3	**Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.**		
Summarize and describe distributions.			
6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.		**D1C7** select, ***create*** and use ***appropriate graphical representation of data, including*** circle graphs, ***histograms*** **D1C8** select, ***create*** and use ***appropriate graphical representation of data*** (including scatter plots) ***and box plots (box and whiskers)***
6.SP.5	Summarize numerical data sets in relation to their context, such as by:		
6.SP.5.a	Reporting the number of observations.	**D1A6** formulate questions, design studies and ***collect data about a characteristic***	

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6.SP.5.b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.		**D1C5 ****describe methods to collect*, organize ***and represent categorical and numerical data***
6.SP.5.c	Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	**D2A6** ***find the range and measures of center, including median, mode and mean***	**D2A8** ***find, use and interpret measures of center, outliers and spread including range and interquartile range***
6.SP.5.d	Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.		**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***
Grade 6 GLEs not included in Grade 6 CAS			

MISSOURI MATHEMATICS CORE ACADEMIC STANDARDS CROSSWALK TO MISSOURI GLES/CLES
CONTENT ALIGNMENTS AND SHIFTS – Grade 6 *DRAFT*

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N1A6 apply and understand whole numbers to millions, fractions and decimals to the thousandths (including location on the number line) **N1B6** recognize and generate equivalent forms of fractions, decimals and percents **N1C6** *recognize equivalent representations for the same number and generate them by decomposing and composing numbers **N3D6** *estimate and justify the results of multiplication and division of positive rational numbers **A1B6** represent and describe patterns with tables, graphs, pictures, symbolic rules or words **A1C6** *compare various forms of representations to identify patterns **A1D6** *identify functions as linear or nonlinear from tables or graphs **G1A6** identify similar and congruent shapes **G3C6** *create polygons and designs with rotational symmetry **G4A6** *use spatial visualization to identify isometric representations of mat plans **M1A6** identify and justify the unit of measure for area and volume (customary and metric) **M1C6** *solve problems involving elapsed time (hours and minutes) **M2B6** *identify and justify an angle as acute, obtuse, straight, or right **D1C6** interpret circle graphs; create and interpret stem-and-leaf plots **D3A6** use observations about differences between 2 samples to make conjectures about the populations from which the samples were taken **D4A6** use a model (diagrams, list, sample space, or area model) to illustrate the possible outcomes of an event		