MISSOURI MATHEMATICS CORE ACADEMIC STANDARDS CROSSWALK TO MISSOURI GLES/CLES
CONTENT ALIGNMENTS AND SHIFTS – Grade 4 *DRAFT*

Grade 4	
Critical Areas In Grade 4, instructional time should focus on three critical areas: 1. developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; 2. developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; and 3. understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.	**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 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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Operations and Algebraic Thinking 4.OA			
Use the four operations with whole numbers to solve problems.			
4.OA.1	Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. http://illustrativemathematics.org/illustrations/356 http://illustrativemathematics.org/illustrations/357	**N1C4** ***recognize equivalent representations for the same number and generate them by decomposing and composing numbers*** **N2B4** ***describe the effects of multiplying*** and dividing ***whole numbers*** as well as the relationship between the two operations **A2A4** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence***	

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4.OA.2	**Multiply or divide to solve word problems involving multiplicative comparison**, e. g., by using drawings and equations with a symbol for the unknown number to represent the problem, **distinguishing multiplicative comparison from additive comparison.** (See CCSS Glossary p. 89, Table 2.) http://illustrativemathematics.org/illustrations/263 http://illustrativemathematics.org/illustrations/356 http://illustrativemathematics.org/illustrations/357		**A2A5** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence using a letter or symbol***
4.OA.3	**Solve multistep word problems** posed with whole numbers and having whole-number answers using the four operations**, including problems in which remainders must be interpreted**. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. http://illustrativemathematics.org/illustrations/356 http://illustrativemathematics.org/illustrations/357	**N3C4** ***apply*** and describe the ***strategy used to compute a given multiplication*** of 2-digit by 2-digit numbers and ***related division facts*** ***N3D4 estimate and justify products of whole numbers***	**N3C3** ***apply*** and describe ***the strategy used to compute*** up to 3-digit ***addition or subtraction problems*** **N3D3** ***estimate and justify sums and differences of whole numbers*** **N3D5** ***estimate and justify*** products, and ***quotients of whole numbers*** and sums differences of decimals and fractions **A2A5** ***using all operations, represent a mathematical situation as*** an expression or ***number sentence using a letter or symbol***
Gain familiarity with factors and multiples.			

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4.OA.4	Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.	**N1D4** classify and ***describe numbers by their characteristics, including*** odd, even, ***multiples and factors***	**N1D5** **describe numbers according to their characteristics, including*** whole number common factors and multiples, ***prime or composite***, and square numbers
Generate and analyze patterns.			
4.OA.5	**Generate a number or shape pattern that follows a given rule.** Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.* http://illustrativemathematics.org/illustrations/487	**A1A4** ***describe geometric and numeric patterns*** **A1B4** ***analyze patterns using words, tables and graphs***	**A1B3** ***represent patterns using words, tables, or graphs***
Number and Operations in Base Ten 4.NBT (Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.)			
Generalize place value understanding for multi-digit whole numbers.			
4.NBT.1	**Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.***	**N1C4** ***recognize equivalent representations for the same number and generate them by decomposing and composing numbers***	

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4.NBT.2	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. http://illustrativemathematics.org/illustrations/459	**N1A4** ***read, write and compare whole numbers*** less than 100,000	**N1C3** ***recognize equivalent representations for the same number*** and generate them by decomposing and composing numbers ***including expanded notation***
4.NBT.3	**Use place value understanding to round multi-digit whole numbers to any place.**		
Use place value understanding and properties of operations to perform multi-digit arithmetic.			
4.NBT.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.		**N3C3** ***apply*** and describe ***the strategy used to compute*** up to 3-digit ***addition or subtraction problems***
4.NBT.5	**Multiply a whole number of up to four digits by a one-digit whole number**, and multiply two two-digit numbers, **using strategies based on place value and** the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**N3C4** ***apply*** and describe ***the strategy used to compute a given multiplication of 2-digit by 2-digit numbers*** and related division facts **A2A4** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence*** **A2B4** ***use the commutative, distributive and associate properties of*** addition and ***multiplication for a multi-digit numbers***	**N2A3** ****represent/model a given situation involving multiplication*** and related division ***using various models including sets, arrays, areas***, repeated addition/subtraction, sharing and partitioning

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4.NBT.6	**Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value**, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**N2A4** ****represent and recognize multiplication and related division using various models including*** equal intervals on the number line, equal size groups, ***distributive property, etc.*** **N2B4** ***describe the effects of multiplying and dividing whole numbers as well as the relationship between the two operations*** **A2A4** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence***	**N2A3** ****represent/model a given situation involving*** multiplication and related ***division using various models including sets, arrays, areas***, repeated addition/subtraction, sharing and partitioning
Number and Operations-Fractions 4.NF (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.)			
Extend understanding of fraction equivalence and ordering.			
4.NF.1	**Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction *(n x a)(n x b)* by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size.** Use this principle to recognize and generate equivalent fractions.	**N1B4** ****use models, benchmarks (0, $\frac{1}{2}$, and 1) and equivalent forms to judge the size of fractions*** **N1C4** ***recognize equivalent representations for the same number and generate them by decomposing and composing numbers***	**N1B5** ***recognize and generate equivalent forms of*** commonly used ***fractions*** and decimals

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4.NF.2	**Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators**, or by comparing to a benchmark fraction such as $\frac{1}{2}$. **Recognize that comparisons are valid only when the two fractions refer to the same whole**. Record the results of comparisons with symbols >, =, or <, **and justify the conclusions**, e.g., by using a visual fraction model.	**N1B4** ****use models, benchmarks (0, $\frac{1}{2}$, and 1) and equivalent forms to judge the size of fractions***	**N1A5** *****read, write and ***compare*** whole numbers less than 1,000,000 unit ***fractions*** and decimals to hundredths ***(including location on the number line)*** **N1B5** recognize and ***generate equivalent forms of*** commonly used ***fractions*** and decimals
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.			
4.NF.3	Understand a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$.		
4.NF.3.a	Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.		**N2B5** ****describe the effects of addition and subtraction on fractions*** and decimals
4.NF.3.b	Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. **Justify decompositions, e.g., by using a visual fraction model**. *Examples:* $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$; $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$.	**N1C4** ***recognize equivalent representations for the same number and generate them by decomposing and composing numbers***	

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4.NF.3.c	Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.		**N1B5** recognize and ***generate equivalent forms of commonly used fractions*** and decimals **N2B5** ****describe the effects of addition and subtraction on fractions*** and decimals **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 **A2B5** ****use the commutative***, distributive, ***and associate properties for fractions*** and decimals
4.NF.3.d	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., **by using visual fraction models and** equations to represent the problem.	**N1B4** ****use models, benchmarks (0, ½, and 1) and equivalent forms to judge the size of fractions*** **A2A4** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence***	**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
4.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. http://illustrativemathematics.org/illustrations/13		

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4.NF.4.a	Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$. *For example, use a visual fraction model to represent $\frac{5}{4}$ as the product 5 x ($\frac{1}{4}$), recording the conclusion by the equation $\frac{5}{4}$ = 5 x ($\frac{1}{4}$).*	**N1C4** ***recognize equivalent representations for the same number and generate them by decomposing and composing numbers*** **N2A4** ****represent and recognize multiplication*** and related division ***using various models*** including equal intervals on the number line, equal size groups, distributive property, etc.	**N1B5** ***recognize and generate equivalent forms of commonly used fractions*** and decimals
4.NF.4.b	**Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.** ***For example, use a visual fraction model to express 3 x ($\frac{2}{5}$) as 6 x ($\frac{1}{5}$), recognizing this product as $\frac{6}{5}$. (in general, n x ($\frac{a}{b}$) = $\frac{n \times a)}{b}$.)***		
4.NF.4.c	Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*	**N2A4** ****represent and recognize multiplication*** and related division ***using various models*** including equal intervals on the number line, equal size groups, distributive property, etc. **A2A4** ***using*** all ***operations, represent a mathematical situation as*** an expression or ***number sentence***	**N3C6** ***multiply*** and divide ***positive rational numbers***
Understand decimal notation for fractions, and compare decimal fractions.			

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4.NF.5	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.) *For example, express* $\frac{3}{10}$ *as* $\frac{30}{100}$*, and add* $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$*.* http://illustrativemathematics.org/illustrations/103 http://illustrativemathematics.org/illustrations/145 http://illustrativemathematics.org/illustrations/152 http://illustrativemathematics.org/illustrations/153 http://illustrativemathematics.org/illustrations/154		**N1B5** recognize and ***generate equivalent forms of commonly used fractions*** and decimals **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
4.NF.6	Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as* $\frac{62}{100}$*; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* http://illustrativemathematics.org/illustrations/103 http://illustrativemathematics.org/illustrations/145 http://illustrativemathematics.org/illustrations/152		**N1B5** recognize and ***generate equivalent forms of commonly used fractions and decimals***

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4.NF.7	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.		**N1A5** ***read, ***write and compare*** whole numbers less than 1,000,000 unit fractions and ***decimals to hundredths (including location on the number line)***
Measurement and Data 4.MD			
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.			
4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), …*	**A3A4** ****model problem situations, using representations such as*** graphs, ***tables*** or number sentences **M1B4** ***identify equivalent linear measures within a system of measurement***	**M1A3** ****identify, justify and use the appropriate unit of measure (linear, time, weight)*** **M1B5** ***identify the equivalent weights and equivalent capacities within a system of measurement*** **M2E5** ***convert from one unit to another within a system of linear measurement (customary and metric)*** **M2E6** ***convert from one unit to another within a system of measurement (mass and weight)*** **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

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4.MD.2	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money**, including problems involving simple fractions or decimals, and** problems that require expressing measurements given in a larger unit in terms of a smaller unit. **Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.**	**M1D4** determine change from $10.00 and ***add and subtract money values*** to $10.00	**M1A3** *identify, justify and ***use the appropriate unit of measure (linear, time***, weight**)** **M1C6** ****solve problems involving elapsed time (hours and minutes)*** **M2E5** ***convert from one unit to another with a system of linear measurement (customary and metric)*** **M2E6** ***convert from one unit to another with a system of measurement (mass*** and weight) **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
4.MD.3	**Apply the area and perimeter formulas** for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*	**M2C4** ***determine*** and justify ***areas of polygons*** and non-polygonal regions imposed on a rectangular grid	**M2C3** ***determine the perimeter of polygons*** **M2C6** ***solve problems involving the area or perimeter of polygons***
Represent and interpret data.			

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4.MD.4	Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*	**D1C4** ***create*** tables or ***graphs to represent categorical and numerical data (including line plots)***	**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 **D1C3** ***read and interpret information from line plots*** and graphs (bar, line, pictorial)
Geometric measurement: understand concepts of angle and measure angles.			
4.MD.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:		
4.MD.5.a	**An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles.**		
4.MD.5.b	**An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.**		
4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.		**M2B7** ****use tools to measure angles to the nearest degree*** and classify the angles as acute, obtuse, right, straight, or reflex

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4.MD.7	**Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts**. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.		**A2A5** using all operations, ***represent a mathematical situation as*** an expression or ***number sentence using a letter or symbol*** **M2B8** ***solve problems of angle measure***, including those involving triangles and parallel lines cut by a transversal
Geometry 4.G			
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.			
4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**G1A4** name and ***identify properties of 1- and 2-,*** and 3-***dimensional shapes*** and describe the attributes of 2- and 3-dimensional shapes ***using appropriate geometric vocabulary*** (rectangular prism, cylinder, pyramid, sphere, cone, ***parallelism, perpendicularity***)	**M2B6** *****identify*** and justify ***an angle as acute, obtuse, straight, or right***
4.G.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	**M2B4** ******select and ***use benchmarks to estimate measurements of*** 0-, ***45- (acute), 90- (right) greater than 90 (obtuse) degree angles***	**G1A5** *******analyze and classify 2-*** and 3-***dimensional shapes by describing their attributes***
4.G.3	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**G3C4** create a figure with multiple lines of symmetry and ***identify the lines of symmetry***	

MISSOURI MATHEMATICS CORE ACADEMIC STANDARDS CROSSWALK TO MISSOURI GLES/CLES
CONTENT ALIGNMENTS AND SHIFTS – Grade 4 *DRAFT*

Core Academic Standard (CAS) **Bold/Highlighted portions** of the CAS indicate content that does not align to any existing GLE/CLE for any course or grade. This content should be included in the instruction and assessment for Grade 4 upon transition to the mathematics CAS. ***Note: The link(s) provided from the Illustrative Mathematics Project in the CAS column provide draft examples intended to illustrate and clarify the CAS.***	**Grade 4 GLE** ***Bold, ITALICIZED portions*** of the 2008 Missouri GLE indicate content that aligns to the CAS for Grade 4. This content should be included in the instruction and assessment for Grade 4 upon transition to the mathematics CAS.	**GLE Shift to Grade 4** ***Bold, ITALICIZED portions*** of these off-grade 2008 Missouri GLEs indicate content that aligns to the CAS for Grade 4. This content should be included in the instruction and assessment for Grade 4 upon transition to the mathematics CAS.
Grade 4 GLEs not included in Grade 4 CAS		
N3A4 *represent a mental strategy used to compute a given multiplication problem (up to 2-digit by 2-digit multiple of) **N3B4** demonstrate fluency with basic number relationships (12 x 12) of multiplication and related division facts **A4A4** *describe mathematical relationships in terms of constant rates of change **G1C4** *describe the results of subdividing, combining and transforming shapes **G2A4** *describe movement using common language and geometric vocabulary (forward, back, left, right, north, south, east, west) **G3A4** predict the results of sliding/translating, flipping/reflecting, or turning/rotating around the center point of a polygon **G4A4** *given the picture of a prism, identify the shapes of the faces **M1A4** *identify and justify the unit of linear measure including perimeter and (customary metric) **M1C4** tell time to the nearest minute **M2A4** *select and use benchmarks to estimate measurements (linear, capacity, weight) **D1A4** collect data using observations, surveys and experiments **D2A4** *describe important features of the data set **D3A4** *given a set of data, propose and justify conclusions that are based on the data		