GRADE 4 MATHEMATICS

Overview:

Domains	Operations and Algebraic Thinking	Number & Operations in Base Ten	Number & Operations: *Fractions*	Measurement and Data	Geometry
Clusters	• Use the four operations with whole numbers to solve problems • Gain familiarity with factors and multiples • Generate and analyze patterns	• Generalize place value understanding for multi-digit whole numbers • Use place value understanding and properties of operations to perform multi-digit arithmetic	• Extend understanding of fraction equivalence and ordering • Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers • Understand decimal notation for fractions, and compare decimal fractions	• Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit • Represent and interpret data • Geometric measurement: understand concepts of angle and measure angles	• Draw and identify lines and angles, and classify shapes by properties of their lines and angles
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.	
Major Interdisciplinary Grade 4 Units	**English Language Arts: across the content areas** • Reading • Writing • Speaking & Listening • Language	**Indian Education for All Titles** • *Less Than Half, More Than Whole* by Kathleen Lacapa • *Powwow* by George Ancona • *Shi-shi-etko* by Nicola L. Campbell	**Science** • Energy: Heat, Light, and Sound • Energy: Electricity and Magnetism • Local Ecosystems: Plant and Animal Interactions- Adaptations and Behavior	**Social Studies Montana and Regions of the United States:** • Learning Geography Skills • Learning About Our State and Region • Becoming Effective Citizens	

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**
   Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

2. Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, multiplication of fractions by whole numbers
Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

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
Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Domain: Operations and Algebraic Thinking

4.OA

Cluster: Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 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.
   - I can interpret a multiplication equation as a comparison, *e.g. Lucy has 35 cookies. Ben has 7 cookies. Lucy has 5 times as many cookies as Ben. (situation/solution equations)*
   - I can represent verbal statements of multiplication comparisons as equations.

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. *(Note: See Glossary, Table 2.)*
   - I can multiply or divide to solve word problems involving multiplicative comparison. For example, A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat costs? a * ? = p, and p / a = ?
   - I can distinguish between multiplication and addition comparison problems.

3. Solve multi-step word problems within cultural contexts, including those of Montana American Indians, 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.
   - I can solve multi-step word problems using whole numbers and all four operations.
   - I can interpret a remainder as a whole number, a fraction, or a decimal.
   - I can solve these equations with an unknown variable.
   - I can check my solutions using mental math, estimation, or rounding.

Cluster: Gain familiarity with factors and multiples.

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.
    - I can identify factor pairs or multiples for all whole numbers from 1 to 100.
    - I can identify a prime or composite number 1 to 100.

Cluster: Generate and analyze patterns.

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.*
    - I can create a number or shape pattern and state its rule.
    - I can explain my pattern to a given rule.

Domain: 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

Cluster: Generalize place value understanding for multi-digit whole numbers.

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.*
    - I can recognize multiples of ten in multi-digit numbers when multiplying and dividing.

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.
    - I can read and write multi-digit whole numbers in expanded form, base ten numerals, and number names.
    - I can compare two multi- digit numbers using >, =, and < symbols (inequalities).

3. Use place value understanding to round multi-digit whole numbers to any place.
    - I can round any multi-digit number.

Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic.

4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
    - I can add and subtract multi-digit whole numbers using the standard algorithm.

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.

- I can illustrate, multiply and explain a four-digit number by a one-digit whole number using an equation, an array, or area model.
- I can multiply, illustrate, and explain a four digit number by a two- digit whole number using an equation, an array or area model.

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.

- I can divide, illustrate, and explain a division problem with a four-digit dividend by a one-digit divisor where the quotient has a remainder using an equation, an array, or area model.
- I can recognize the distributive, associative, commutative, or identity properties, and order of operations when doing division problems.
- I can find a quotient using an equation, array or area model.

Domain: 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, 100.

Cluster: Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ 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.
   - I can produce equivalent fractions with visual models.

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 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.
   - I can find a common denominator.
   - I can compare fractions using >, =, < (inequalities and equalities).

Cluster: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
      - I can add unit fractions.
      - I can add or subtract fractions with like denominators.
   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: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*

- I can decompose a fraction or a mixed number into its smaller parts more than one way, e.g., ⅜ = ⅛ + ⅛ + ⅛ ; 2 ⅛ = 8/8 + 8/8 + ⅛

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.

- I can add and subtract improper fractions with like denominators.

d. Solve word problems within cultural contexts, including those of Montana American Indians, 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.

- I can add and subtract fractions to solve word problems involving by implementing visual models and/or equations.

4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

- I can multiply a fraction by a whole number.
- I can demonstrate a fraction of a whole with a visual model.

b. Understand a multiple of *a/b* as a multiple of *1/b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*

- I can demonstrate the associative property when multiplying a whole number by a fraction.

c. Solve word problems within cultural contexts, including those of Montana American Indians, 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 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? As a contemporary American Indian example, for family/cultural gatherings the Canadian and Montana Cree bake bannock made from flour, salt, grease, and baking soda, in addition to ¾ cup water per pan. When making four pans, how much water will be needed?*

- I can interpret a word problem that involves multiplication of a fraction by a whole number.

Cluster: Understand decimal notation for fractions, and compare decimal fractions.

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 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

- I can generate equivalent fractions where the denominators are multiples of 10.

6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
   - I can convert fractions with denominators that are multiples of 10 into decimals.
   - I can compare an equivalent fraction to its corresponding decimal.

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.
   - I can compare, using inequalities or equalities, two decimals to the hundredths place using a visual model.

Domain: Measurement and Data
4.MD
Cluster: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

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)...*
   - I can explain customary and metric units of measure.
   - I can generate a conversion table for customary and metric units of measure.
   - I can explain the units of time.

2. Use the four operations to solve word problems within cultural contexts, including those of Montana American Indians, 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.
   - I can solve word problems using the four operations involving units of measurement, such as intervals of time, volume, mass, distance, and money.
   - I can create a diagram that features quantities of measurement.
   - I can show measurement in fraction and decimal form.

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.*
   - I can apply my knowledge of area and/or perimeter to real world situations.

Cluster: Represent and interpret data.

4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 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 or arrow/spearhead collection.*
    - I can create a line plot showing fractional units
    - I can solve problems with a line plot showing fractional units.

Cluster: Geometric measurement: understand concepts of angle and measure angles.

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
    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 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.
    - I can recognize and measure angles.
    - I can demonstrate angles of degrees in a circle.

    b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
    - I can interpret the measurement of an angle.

6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
    - I can create a specific angle using a protractor.
    - I can measure a specific angle using a protractor.

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.
    - I can manipulate two non-overlapping angles into a larger angle.
    - I can use addition and subtraction to find an unknown angle in a real world situation.

Domain: Geometry

4.G

Cluster: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
    - I can create and identify points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.

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.
   - I can classify two-dimensional figures based on the attributes of the figures. i.e.: parallel and perpendicular lines, angles.
   - I can identify a right triangle.

3. Recognize a line of symmetry for a two-dimensional figure, including those found in Montana American Indian designs, 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.
   - I can recognize lines of symmetry of two-dimensional figures.
   - I can design or draw a two-dimensional figure using lines of symmetry.

Standards	**Explanations and Examples**
Students are expected to:	**The Standards for Mathematical Practice describe ways in which students ought to engage with the subject matter as they grow in mathematical maturity and expertise.**
4.MP.1. Make sense of problems and persevere in solving them.	In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.
4.MP.2. Reason abstractly and quantitatively.	Fourth graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts.
4.MP.3. Construct viable arguments and critique the reasoning of others.	In fourth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.
4.MP.4. Model with mathematics.	Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fourth graders should evaluate their results in the context of the situation and reflect on whether the results make sense.
4.MP.5. Use appropriate tools strategically.	Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper or a number line to represent and compare decimals and protractors to measure angles. They use other measurement tools to understand the relative size of units within a system and express measurements given in larger units in terms of smaller units.
4.MP.6. Attend to precision.	As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.
4.MP.7. Look for and make use of structure.	In fourth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems such as tree diagrams and arrays to the

	multiplication principal of counting. They generate number or shape patterns that follow a given rule.
4.MP.8. Look for and express regularity in repeated reasoning.	Students in fourth grade should notice repetitive actions in computation to make generalizations Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Grade 4 Montana Common Core Standards Vocabulary		
acute angle	equivalent fraction	Order of Operations
area	estimation	parallel lines
area model	expanded form	perimeter
array	factor pair	perpendicular lines
Associative Property	factors	place value form
Commutative Property	hundredths	point
compose	Identity Property	prime number
composite number	improper fraction	product
congruent	inequalities <, =, >	quotient
customary measurement	line	rays
decimal point	line plot	remainder
decompose	line segments	right angle
degrees of an angle	mass	rounding
denominator	metric measurement	sets of
difference	mixed number	standard form
Distributive Property	multiples	sum
dividend	multiplicative comparison, i.e... as many as	symmetry
divisor	numerator	tenths
end point	obtuse angle	variables
equation	operations	volume