GRADE 3 MATHEMATICS

Overview:

Domains	Operations and Algebraic Thinking	Number & Operations in Base Ten	Number & Operations: *Fractions*	Measurement and Data	Geometry
Clusters	• Represent and solve problems involving multiplication and division • Understand properties of multiplication and the relationship between multiplication and division • Multiply and divide within 100 • Solve problems involving the four operations, and identify and explain patterns in arithmetic	• Use place value understanding and properties of operations to perform multi-digit arithmetic	• Develop understanding of fractions as numbers	• Solve problems involving measurement and estimation of intervals of time, liquid, volumes and masses of objects • Represent and interpret data • Geometric measurement: understand concepts of area and relate area to multiplication and to addition • Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures	• Reason with shapes and their attributes

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 3 Units	**English Language Arts: across the content areas** • Reading • Writing • Speaking & Listening • Language	**Indian Education for All Titles** • *Beaver Steals Fire* by Confederated Salish/Kootenai Tribes • *War Shirt* by Bently Spang • *When the Shadbush Blooms* by Carla Messinger	**Science** • Geology: Earth Materials and Changes • Weather and the Water Cycle • Simple Machines	**Social Studies Community and Change:** • Our Community and Its Heritage • Comparing Past to Present • Meeting Ordinary and Extraordinary People

In Grade 3, instructional time should focus on four critical areas (note: multiplication, division, and fractions are the most important developments):

1. Developing understanding of multiplication and division and strategies for multiplication and division within 100

Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

2. Developing understanding of fractions, especially unit fractions (fractions with numerator 1)

Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket; but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

3. Developing understanding of the structure of rectangular arrays and of area

Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

4. Describing and analyzing two-dimensional shapes

Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Domain: Operations and Algebraic Thinking

3.OA

Cluster: Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*
    - I can explain products of whole numbers as the total number of objects in a number of groups.

2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
    - I can explain whole number quotients as the number of objects in each group when a whole number is partitioned equally.

3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. *(Note: See Glossary, Table 2.)*
    - I can use drawings and equations to solve multiplication and division word problems involving equal groups, arrays, and measurement quantities or units of measurement.

4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?*
    - I can describe, using examples, that multiplication and division are inverse operations or that they are related.
    - I can solve for an unknown whole number in a multiplication and division equation.

Cluster: Understand properties of multiplication and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide. *(Note: Students need not use formal terms for these properties.) Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*
    - I can apply properties of operations as strategies to multiply and divide.

6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*
    - I can solve division problems with unknown factors, using multiplication.

Cluster: Multiply and divide within 100.

7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
    - I can fluently recall multiplication and division facts within 100 using the properties of operations.
    - I can master my multiplication and division facts within 100 by the end of Grade 3.

Cluster: Solve problems involving the four operations, and identify and explain patterns in arithmetic.

8. Solve two-step word problems using the four operations within cultural contexts, including those of Montana American Indians. 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. *(Note: This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order.*
    - I can solve two-step word problems using the four operations.
    - I can represent an unknown quantity in an equation with a variable.

- I can decide if an answer is reasonable using estimation.

9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*
    - I can demonstrate my understanding of arithmetic patterns using the properties of operations.

Domain: Number and Operations in Base Ten

3.NBT

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

(Note: A range of algorithms may be used.)

1. Use place value understanding to round whole numbers to the nearest 10 or 100.
    - I can round whole numbers to the nearest 10 or 100.

2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
    - I can fluently add and subtract within 1000.

3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
    - I can multiply one- digit whole numbers by multiples of 10 in the range 10- 90.

Number and Operations—Fractions

3.NF

(Note: Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, 8.)

Cluster: Develop understanding of fractions as numbers.

1. Understand a fraction 1/*b* as the quantity formed by 1 part when *a* whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by a parts of size 1/*b*.
    - I can identify the parts of a fraction and explain their meanings.

2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.
    a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.
        - I can explain how a fraction is a number on a number line.
        - I can represent fractions on a number line.
        - I can divide a number line into equal intervals (parts) to represent fractions.
    b. Represent a fraction *a*/*b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.
        - I can place fractions on a number line that is divided into equal intervals.

3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
   - I can show two fractions as equivalent (equal) if they are the same size.
   - I can show two fractions as equivalent (equal) if they are on the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.
   - I can recognize and generate simple equivalent fractions.
   - I can justify why fractions are equivalent.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*
   - I can express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
   - I can compare fractions with the same numerator.
   - I can compare fractions with the same denominator.
   - I can use >, <, = symbols to justify my conclusions when I compare fractions.

Domain: Measurement and Data

3.MD

Cluster: Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.
   - I can tell and write time to the nearest minute.
   - I can solve word problems involving addition and subtraction of time intervals in minutes.

2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).(Note: Excludes multiplicative comparison problems (problems involving notions of "times as much"; see Glossary, Table 2). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.(*Note: Excludes compound units such as cm3 and finding the geometric volume of a container.)*
   - I can measure liquid volumes and masses of objects using grams, kilograms, and liters.
   - I can estimate liquid volumes and masses of objects using grams, kilograms, and liters.

- I can add, subtract, multiply, or divide to solve word problems involving masses or volumes in the same units.

Cluster: Represent and interpret data.

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories, within cultural contexts, including those of Montana American Indians. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*
   - I can draw a picture graph to represent a set of data.
   - I can create a bar graph to represent a set of data.
   - I can solve one- and two- step "how many more" and "how many less" problems from a bar graph.

4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.
   - I can measure and record lengths to the nearest half and fourth of an inch.
   - I can use measurement data to make a horizontal line plot, which is marked off in appropriate units.

Cluster: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

5. Recognize area as an attribute of plane figures and understand concepts of area measurement.
   a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
      - I can use square units to measure area.
   b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.
      - I can label area with square units.

6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
   - I can measure area by counting unit squares.

7. Relate area to the operations of multiplication and addition.
   a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
      - I can use tiles to find the area of a rectangle.
      - I can multiply the side lengths to find the area of a rectangle.
   b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
      - I can solve real world problems incorporating area.

c. Products as rectangular areas in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
   - I can use tiles to make the area of a rectangle.
   - I can represent the distributive property using this model.

d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems, including those of Montana American Indians.
   - I can find the area of irregular figures by adding the areas of smaller rectangles within the figure.
   - I can apply the area of irregular figures in real world settings.

Cluster: Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
   - I can solve real world and mathematical problems involving perimeter and area of polygons.

Domain: Geometry

3.G

Cluster: Reason with shapes and their attributes.

1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
   - I can classify shapes by their attributes.
   - I can identify the attributes that make a rhombus, rectangle, and a square quadrilateral.
   - I can draw examples of quadrilaterals that are not rhombuses, rectangles, and squares.

2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*
   - I can divide shapes into equal areas.
   - I can write the area of each part of a shape as a fraction.

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.**
3.MP.1. Make sense of problems and persevere in solving them.	In third 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. Third 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.
3.MP.2. Reason abstractly and quantitatively.	Third 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.
3.MP.3. Construct viable arguments and critique the reasoning of others.	In third grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. 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.
3.MP.4. Model with mathematics.	Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, 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. Third graders should evaluate their results in the context of the situation and reflect on whether the results make sense.
3.MP.5. Use appropriate tools strategically.	Third 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 to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles.
3.MP.6. Attend to precision.	As third 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, when figuring out the area of a rectangle they record their answers in square units.
3.MP.7. Look for and make use of structure.	In third grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to multiply and divide (commutative and distributive properties).
3.MP.8. Look for and express regularity in repeated reasoning.	Students in third grade should notice repetitive actions in computation and look for more shortcut methods. For example, students may use the distributive property as a strategy for using products they know to solve products that they don't know. For example, if students are asked to find the product of 7 x 8, they might decompose 7 into 5 and 2 and then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, "Does this make sense?"

Standard	Grade 3 Montana Common Core Standards Vocabulary
3.OA.1	multiplication, factor, product
3.OA.2	division, dividend, divisor, quotient
3.OA.3	multiplication, division, array, equation
3.OA.4	multiplication, division, equation
3.OA.5	multiplication, division, commutative property, associative property, distributive property
3.OA.6	multiplication, division, factor
3.OA.7	multiplication, division, commutative property, associative property, distributive property
3.OA.8	order of operations, estimation, rounding
3.OA.9	arithmetic pattern
3.NBT.1	place value, rounding
3.NBT.2	place value, algorithm
3.NBT.3	place value, multiply
3.NF.1	fraction, unit fraction, numerator, denominator
3.NF.2	fraction, unit fraction, numerator, denominator, number line
3.NF.3	fraction, unit fraction, numerator, denominator, equivalent
3.MD.1	minute, number line
3.MD.2	volume, mass, standard units
3.MD.3	scaled picture graph, sealed bar graph
3.MD.4	line plot, scale, half/halves, quarter, fourth
3.MD.5	area, plane figure, unit square
3.MD.6	area, unit square
3.MD.7	area, area model, distributive property, additive
3.MD.8	perimeter, area
3.G.1	attribute, quadrilateral, rectangle, rhombus, square, parallelogram, trapezoid, kite
3.G.2	area, unit fraction