GRADE FOUR

MATHEMATICS	OPERATIONS AND ALGEBRAIC THINKING (MULTIPLICATION)
COMMON CORE STANDARDS	

KNOW

(Factual)

Multiplication scenarios can be interpreted differently based on the context of the problem. Ex: A “5 times greater than 7” problem is interpreted differently than “5 groups of 7” but both are derived from 5 x 7.

Additive thinking is “how many more”.

Multiplicative thinking is “how many times more”.

Problems can be solved by writing the solution pathway in algebraic notation and then solving for the unknown.

Estimation in multiplication and division can predict the size of the answer & help to assess the reasonableness of a solution.

UNDERSTAND

(Conceptual)

Factors and multiples can be used to determine part-whole relationships.

By utilizing efficient methods of multiplication and division, more complex problem solving is possible.

GRADE FOUR

MATHEMATICS COMMON CORE STANDARDS	OPERATIONS AND ALGEBRAIC THINKING (MULTIPLICATION)

DO

(Procedural, Application, Extended Thinking)

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. **CC.4.OA.1**

Compare quantities by thinking "N times as large" is necessary to compare units of measure, e.g., when comparing yards to feet, "A yard is 3 times as large as a foot."

Compare quantities by thinking "10 times as large" is necessary to compare the place value of the digits, e.g., 70 is 10 times as large as 7.

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.1

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. **CC.4.OA.3 CC.4.OA.2**

EX: "I can write 5 poems every day. I already have a poem in my journal. How many days should I work to have a total 31 poems in my journal?" 5 x N + 1 = 31

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. **CC.4.OA.4**

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.* **CC.4.OA.5**

Connections to other domains &/or Clusters:

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), ...* **CC.4.MD.1**

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. **CC.4.MD.2**

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.* **CC.4.MD.3**

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.* **CC.4.NBT.1**

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. **CC.4.NBT.2**

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. **CC.4.NBT.4**

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

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

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).* **CC.4.NF.4a**

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.)* **CC.4.NF.4b**

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 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?* **CC.4.NF.4c**

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. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* **CC.4.NF.5**

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. **CC.4.NF.7**

GRADE FOUR

MATHEMATICS	NUMBER AND OPERATIONS BASE TEN- PLACE VALUE
COMMON CORE STANDARDS	
4.NBT.1, 4.NBT.2, 4.NBT.3, 4.NBT.4, 4.NBT.5, 4.NBT.6	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
Expanded notation can be used to show order, values of each digit, and the powers of 10. The Distributive Property of Multiplication can be modeled in an array as well as with expanded notation. Rounding a number to the largest place value can be accomplished by answering: "Is this number closest to N-thousand or N+1 thousand?" Multiplication and division are inverse operations.	**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.* **CC.4.NBT.1** 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. **CC.4.NBT.2** 3. Use place value understanding to round multi-digit whole numbers to any place. **CC.4.NBT.3** **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. **CC.4.NBT.4** Use commutative and associative properties to show methods of solving problems. Prove algorithms by using expanded notation. Ex: 400 + 20 + 7 300 + 50 + 2 --- 700 + 70 + 9 = 779 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. **CC.4.NBT.5** Efficient strategies rely on the distributive property of multiplication. Ex: 4327 x 8 = (4000x8) + (300x8) + (20x8) + (7x8) **Or** by decomposing & utilizing the associative property. Ex: 70 x 3 = 7 x 10 x 3 = 7 x 3 x 10 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. **CC.4.NBT.6** Remove groups of 10s, 100s, or multiples of 10s, 100s. Use knowledge of multiplication to solve division problems. **Connections to other Domains &/or Clusters:** **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 100.4 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.* **CC.4.NF.6** *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* **CC.4.NF.5** 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. **CC.4.NF.7** Mathematically proficient students acquire precision in the use of mathematical language by engaging in discussion with others and by giving voice to their own reasoning. By the time they reach high school they have learned to examine claims, formulate definitions, and make explicit use of those definitions. The terms students should learn to use with increasing precision in this unit are: **Place Value, Standard**
UNDERSTAND	
(Conceptual)	
The number system is a repeated counting pattern based on tens and powers of ten. Efficient strategies for multi-digit arithmetic are based on applying the properties of operations.	

GRADE FOUR

MATHEMATICS COMMON CORE STANDARDS 4.NF.1, 4.NF.2, 4.NF.4, 4.NF.6, 4.NF.7	NUMBER & OPERATIONS – FRACTIONS-EQUIVALENCE, COMPARING FRACTIONS & DECIMALS
KNOW *(Factual)*	**DO** *(Procedural, Application, Extended Thinking)*
Multiplying a fraction by one always results in an equivalent fraction. Ex: ¼ x 3/3 = 3/12 Equivalent fractions can be generated using area models, ratio models, number lines and fractions bars. Compare fractions using common denominator, common numerator, comparison to benchmark and distance to benchmark; as well as determining when each strategy is appropriate. Compare decimal fractions using 10x10 grid, a number line, and measurement such as metric system, money.	*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.** 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. **CC.4.NF.1** 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. **CC.4.NF.2** • Models that can show equivalence include area models, ratio model, number line, and fraction bars. • 3/6=4/8 because both are equal to ½. • ½=3/6 because numerator and denominator are multiplied by the same number (1/2 x 3/3 = 3/6). **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. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* **CC.4.NF.5** 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.* **CC.4.NF.6** 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. **CC.4.NF.7** **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), ...* **CC.4.MD.1** 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. **CC.4.MD.2**
UNDERSTAND *(Conceptual)* Equivalent fractions or decimal fractions represent the same quantity in multiple ways. Using visual models and place value is helpful in comparing fractions and decimals.	

GRADE FOUR

MATHEMATICS	NUMBERS AND OPERATIONS –FRACTIONS- OPERATIONS
COMMON CORE STANDARDS	
4.NF.3a-d, 4.NF.4a-c	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*

A fraction a/b is a multiple of $1/b$ (i.e., *a* groups of $1/b$ = *a* x $1/b$. For example: $5/4$ is the same as 5 sets of ¼ or 5 x ¼)

A mixed number is the sum of its decomposed fractional parts. For example: 2 ¼ = $4/4 + 4/4$ + ¼

Decomposing ¾ into ¼ + ¼ + ¼ allows for adding or subtracting fourths.

Either factor can be the multiplier when multiplying a fraction by a whole number: ½ x 6 or 6 x ½

Visual Fraction models: Area model, array, number line, fraction bars, clock model

Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

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*. **CC.4.NF.3**

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. **CC.4.NF.3a**

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 ;*

$2\ 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$. **CC.4.NF.3b**

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. **CC.4.NF.3c**

Ex: Us the associative property to solve problems.

2 ¼ + 3 ¾ = 2 + 3 + ¼ + ¾

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. **CC.4.NF.3d**

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

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).* **CC.4.NF.4a**

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.)* **CC.4.NF.4b**

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 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?* **CC.4.NF.4c**

Connections to other Domains &/or Clusters:

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

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. **CC.4.MD.2**

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 collection.* **CC.4.MD.4**

UNDERSTAND
(Conceptual)

Fractions are built from unit fractions through the process of addition and multiplication.

Visual fraction models and equations are tools for adding fractions, subtracting fractions, and multiplying a fraction by a whole number

GRADE FOUR

MATHEMATICS COMMON CORE STANDARDS 4.MD.1, 4.MD.2, 4.MD.3	MEASUREMENT AND DATA- MEASUREMENT SYSTEMS, AREA & PERIMETER, DATA
KNOW *(Factual)*	DO *(Procedural, Application, Extended Thinking)*
Relative sizes of measurement units (km, cm, kg, ,g, lb, oz., liter, ml, min. sec. Hour) Equivalent measurements within a measurement system can be used to solve problems. Ex: 4m = 400cm, and 24in = 2 ft. An array model can justify the formulas: A=LxW and P=2L+2W Line plots with whole numbers must include all the whole numbers in the range. Line plots with fractions must include all whole numbers and fractions within the range. (3, 3 ½, 4, ½,) Consistent increments	**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), …* **CC.4.MD.1** 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. **CC.4.MD.2** 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.* **CC.4.MD.3** **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 collection.* **CC.4.MD.4** **Connections to other Domains and/or Clusters:** **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*. **CC.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. **CC.4.NF.3d** **Understand decimal notation for fractions, and compare decimal fractions.** 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.* **CC.4.NF.6** 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. **CC.4.NF.7**
UNDERSTAND *(Conceptual)*	
Within a single system of measurement larger units are made from smaller units. (1 km=1,000 meters) Smaller units are divisions of larger unit (1 cm = 1/100 of a meter) Formulas are an efficient way to solve for area and perimeter. Line plots can be used to represent data.	

GRADE FOUR

MATHEMATICS	GEOMETRY AND ANGLE MEASUREMENT
COMMON CORE STANDARDS	
4.MD.5a-b, 4.MD.6, 4.MD.7, 4.G.1, 4.G.2, 4.G.3	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
An angle is a turn Angles are measured in degrees.(1 full turn is 360 degrees, ½ turn =180 degrees, ¼ turn=90 degrees) A larger angle can be decomposed into smaller angles Two or more angles can be combined to make a larger angle 2D shapes have angles at every vertex. Perpendicular lines intersect at a 90 degree angle. Parallel lines never intersect. A 2D figure has line symmetry if it can be folded along the line into matching parts.	**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: **CC.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 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. **CC.4.MD.5a** b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. **CC.4.MD.5b** 6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. **CC.4.MD.6** 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. **CC.4.MD.7** **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. **CC.4.G.1** 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. **CC.4.G.2** -Distinguish between parallel & perpendicular lines. . 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. **CC.4.G.3** **Connections to other Domains &/or Clusters:** 4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. **CC.4.NF.4** 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).* **CC.4.NF.4a**
UNDERSTAND *(Conceptual)* An angle is measured with reference to a circle and a circle is measured in terms of 360 degrees (full circle= 360 degrees) Two-dimensional shapes can be classified based on properties of their angles (right, acute, obtuse,) and/or properties of their line segments (parallel, perpendicular).	