GRADE FIVE

MATHEMATICS COMMON CORE STANDARDS 5.OA.1, 5.OA.2, 5.OA.3	OPERATIONS AND ALGEBRAIC THINKING (EXPRESSIONS & RELATIONSHIPS)
KNOW *(Factual)*	DO *(Procedural, Application, Extended Thinking)*
Order of Operations – Mathematical computations are performed following a given order: the order of operations. Functions of mathematical symbols Numerical patterns can be generated based on a rule. Ordered pairs form a relationship that generate a pattern and can be represented in multiple ways (tables, graphs, etc.) Numerical patterns (i.e. 0, 3, 6, 9, etc.) Parts of ordered pairs	**Write and interpret numerical expressions.** 1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. **CC.5.OA.1** 2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* **CC.5.OA.2** **Analyze patterns and relationships.** 3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* **CC.5.OA.3**
UNDERSTAND *(Conceptual)*	**Connections to other Domains &/or Clusters:** **Graph points on the coordinate plane to solve real-world and mathematical problems.** 4. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). **CC.5.G.1** 5. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. **CC.5.G.2**
Mathematical rules and expressions depict mathematical relationships.	

GRADE FIVE

MATHEMATICS	NUMBER AND OPERATIONS BASE TEN- UNDERSTANDING PLACE VALUE
COMMON CORE STANDARDS	
5.NBT.1, 5.NBT.2, 5.NBT.3a-b, 5.NBT.4, 5.NBT.5, 5.NBT.6, 5.NBT.7	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
Place value is based on multiples of ten. A digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. When multiplying/dividing whole numbers & decimals by powers of 10, the digits move based on place value, not the decimal point. Multiplying & dividing whole numbers and decimals by 10 results in a pattern of zeros. (See example for standard 5.NBT.2). Decimal numbers fall between whole numbers. Proximity of a decimal to the nearest whole number. Rounding is a formal way of estimating. Process of standard algorithm for multiplication (There are multiple standard algorithms: partial products/distributed multiplication, traditional). Strategies for dividing whole numbers (See standard 5.NBT.6 - Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models) Strategies to perform all operations. Properties of operations (i.e. distributive property) Addition & subtraction are inverse operations. Multiplication & division are inverse operations.	**Understand the place value system.** 1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. **CC.5.NBT.1** 2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. **CC.5.NBT.2** Ex: 247 x 100 = (200 x 100) + (40 x 100) + (7 x 100) = 20,000 + 4,000 + 700 = 24,700 247/10 = (200/10) + (40/10) + (7/10) = 20 + 4 + .7 = 24.7 24.7 x 10 = (20 x 10) + (4 x 10) + (.7 x 10) = 200 + 40 + 7 = 247 3. Read, write, and compare decimals to thousandths. **CC.5.NBT.3** a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). **CC.5.NBT.3a** b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. **CC.5.NBT.3b** 4. Use place value understanding to round decimals to any place. **CC.5.NBT.4** **Perform operations with multi-digit whole numbers and with decimals to hundredths.** 5. Fluently multiply multi-digit whole numbers using the standard algorithm. **CC.5.NBT.5** 6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-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.5.NBT.6** 7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. **CC.5.NBT.7** **Connections to other Domains &/or Clusters:** **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** 4. unit cubes, using cubic cm, cubic in, cubic ft., and improvised units. **CC.5.MD.4** 5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. **CC.5.MD.5** a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. **CC.5.MD.5a** b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. **CC.5.MD.5b** c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. **CC.5.MD.5c**
UNDERSTAND	
(Conceptual)	
The value of a digit in our number system is determined by its place value position. Place value patterns are continued in decimal numbers. Computational strategies with whole numbers can be applied to decimals.	

GRADE FIVE

MATHEMATICS	NUMBER & OPERATIONS – FRACTIONS-ADDING & SUBTRACTING
COMMON CORE STANDARDS	
5.NF.1, 5.NF.2	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
Fractions can be added & subtracted using area models, ratio models, number lines, fraction bars, and finding common denominators. Relationship between numbers and their multiples are used to find equivalent fractions. Benchmark fractions and fraction number sense can be used to estimate fraction sums and differences and assess the reasonableness of solutions. Methods for recording strategies for adding & subtracting fractions using models or equations.	**Use equivalent fractions as a strategy to add and subtract fractions.** 1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* **CC.5.NF.1** -Add and subtract fractions with like denominators - Add and subtract fractions with unlike denominators using models. - Find common denominators. 2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.* **CC.5.NF.2** -Use benchmark fractions and fraction number sense to estimate fraction sums and differences. -Check the reasonableness of an answer within the context of the problem. **Connections to other Domains &/or Clusters:** **Represent and interpret data.** 2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* **CC.5.MD.2**
UNDERSTAND	
(Conceptual)	
Equivalent fractions are a powerful strategy for adding and subtracting fractions. Multiple strategies & models can be utilized to solve a variety of problems involving fractional concepts	

GRADE FIVE

MATHEMATICS	NUMBERS AND OPERATIONS –FRACTIONS- MULTIPLYING & DIVIDING
COMMON CORE STANDARDS	
5.NF.3, 5.NF.4a-b, 5.NF.5a-b, 5.NF.6, 5.NF.7a-c	

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

Fractions can be perceived and utilized as division of the numerator by the denominator.
Multiplying a whole number by a number greater than 1 results in a product greater than the given number. (Ex: 31/2 x 5 will result in a number more than 31/2)
Multiplying a whole number by a number smaller than 1 results in a product less than the given number. (Ex:31/2 x 1/4 will result in a number less than 31/2)
Multiplying a whole number by a number/ fraction equal to 1 results in a number that represents the same quantity.
When multiplying fractions, either factor can be the multiplier. (Ex:2/3 x 4 can be interpreted as 2/3 of 4 or 4 groups of 2/3.)
Visual fraction models can be used to solve problems like 1/3 divided by 4 or 4 divided by 1/3.
An array model can justify the formula: A=LxW

UNDERSTAND

(Conceptual)

Extending previous understandings of multiplication & division can help you solve problems involving multiplying & dividing fractions.

Decompose & recompose fractions to solve problems involving multiplication and division of fractions.

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

3. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* **CC.5.NF.3**

Interpret a fraction as division of the numerator by the denominator.

Use visual fraction models or equations to solve problems involving division of whole numbers in which the answers are fractions or mixed numbers.

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. **CC.5.NF.4**

a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* **CC.5.NF.4a**

Use visual models to show the multiplication of two fractions (Ex: 1/2 of 1/4)

Multiply a fraction by a whole number. (EX: 2/3 x 4 is 4 sets of 2/3 or 8 sets of 1/3)

b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. **CC.5.NF.4b**

5. Interpret multiplication as scaling (resizing), by: **CC.5.NF.5**

a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. **CC.5.NF.5a**

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. **CC.5.NF.5b**

Reason whether multiplying by a fraction greater or less than 1 will result in a product greater or less than 1.

6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. **CC.5.NF.6**

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.1

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* **CC.5.NF.7a CC.5.NF.7**

b. Interpret division of a whole number by a unit fraction, and compute such quotients. F*or example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* **CC.5.NF.7b**

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* **CC.5.NF.7c**

Connect division of a whole number by a fraction (2 divided by 1/3) to a context such as "How many 1/3 cup servings are in 2 cups of raisins?"

Connect division of a fraction by a whole number (1/2 divided by 3) to a context such as "How much chocolate will each person get if 3 people share 1/2 a pound of chocolate equally?" **Connections to other Domains &/or Clusters:**

6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-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.5.NBT.6**

7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. **CC.5.NBT.7**

GRADE FIVE

MATHEMATICS COMMON CORE STANDARDS 5.MD.1, 5.MD.2, 5.MD.3, 5.MD.4, 5.MD.5	MEASUREMENT AND DATA- MEASUREMENT SYSTEMS, LINE PLOTS, VOLUME
KNOW *(Factual)*	**DO** *(Procedural, Application, Extended Thinking)*
Standard Measurement Units can be used interchangeably. Data can be organized, represented, & interpreted in multiple ways. Volume is an attribute of solid figures relating length, width, and height (depth). Volume is "filling" the inside space if a 3D shape. Volume is additive: The volumes of two non-overlapping rectangular prisms can be added to find a total volume. The formula V=B•h relates the total volume as multiple layers of the Base (area). The area of a rectangular base can be utilized when calculating the volume.	**Convert like measurement units within a given measurement system.** 1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. **CC.5.MD.1** **Represent and interpret data.** 2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* **CC.5.MD.2** Connect to operations with fractions to solve problems in measurement and data contexts. **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** 3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement. **CC.5.MD.3** a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. **CC.5.MD.3a** b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. **CC.5.MD.3b** 4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. **CC.5.MD.4** 5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. **CC.5.MD.5** a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. **CC.5.MD.5a** b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. **CC.5.MD.5b** c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. **CC.5.MD.5c** Clarification of 5.MD.2 can be interpreted as students displaying a data set that includes fractions, using the operations of fractions to interpret the data (i.e. finding the mean (average) of fractional data.) Decompose a rectangular prism into multiple layers of the area of the base layer of the figure and relate that back their understanding of volume. Connect to multiplication concepts in Number & Operations in Base Ten to solve problems in geometric measurement contexts.
UNDERSTAND *(Conceptual)*	
There are a multiple ways to organize, recognize, and interpret data for a variety of purposes. The concepts of volume are related to area, multiplication and division.	

GRADE FIVE

MATHEMATICS	GEOMETRY-GRAPHING & PROPERTIES OF 2D FIGURES
COMMON CORE STANDARDS	
5.G.1, 5.G.2, 5.G.3, 5.G.4	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
A pair of perpendicular lines form a coordinated system, with the intersection of the lines (the origin) is coordinated to form the point (0,0). The first number in an ordered pair tells how far to travel from the origin on the x-axis, and second number says how far to travel on the y-axis. Points that lie on a graphed (linear) line express equivalent ratios. Points graphed on a coordinate plan can be interpreted to solve problems. Two-dimensional shapes are classified by their attributes (i.e. # of sides, # of angles, types of angles, regular vs. irregular polygons, etc.).	**Graph points on the coordinate plane to solve real-world and mathematical problems.** 1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). **CC.5.G.1** 2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. **CC.5.G.2** **Classify two-dimensional figures into categories based on their properties.** 3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* **CC.5.G.3** 4. Classify two-dimensional figures in a hierarchy based on properties. **CC.5.G.4**
UNDERSTAND	
(Conceptual)	
Coordinate systems can be used to describe locations precisely. 2-D shapes can be identified, classified and analyzed by their properties.	**Connections to other Domains &/or Clusters:** **Analyze patterns and relationships.** 3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.* **CC.5.OA.3**