GRADE THREE

MATHEMATICS	OPERATIONS AND ALGEBRAIC THINKING (MULTIPLICATION & DIVISION)
COMMON CORE STANDARDS	
3.OA.1, 3.OA.2, 3.OA.3, 3.OA.4, 3.OA.5, 3.OA.6, 3.OA.7, 3.OA.8, 3.OA.9, 3.NBT.3	

KNOW

(Factual)

Notation:
- Multiplication and division notation (including different division signs:)
- Methods of recording multiplication strategies using equations and arrays.
- A letter can be used to stand for an unknown quantity.

Strategies:
- Repeated addition
- Skip-counting
- Mental strategies for multiplying single-digit numbers (e.g., using a fact you know to solve a fact that you don't know)
- Partial products for multiplication (partial products can be notated using equations and/or arrays and area)
- Doubling and halving
- Division problems can be solved by thinking of them as unknown factor problems
- Estimation can be used to predict a reasonable answer.

Models/Representations:
- Drawings of equal groups
- Arrays
- Areas

Concepts/Big Ideas:
- Division word problems can require finding the unknown number of groups or the unknown group size (grouping problems and sharing problems).
- Multiplication and division are inverse operations.
- Fact families for multiplication and division.

Other:
Be fluent with all products of two one-digit numbers.

UNDERSTAND

(Conceptual)

Multiplication and division situations involve equal-size groups, arrays, and/or area models.

Multiplication and division are inverse operations.

The commutative, associative, and distributive properties can be used to develop efficient strategies to multiply and divide. (Students do not need to know the names of these operations.)

GRADE THREE

MATHEMATICS	OPERATIONS AND ALGEBRAIC THINKING (MULTIPLICATION & DIVISION)
COMMON CORE STANDARDS	
3.OA.1, 3.OA.2, 3.OA.3, 3.OA.4, 3.OA.5, 3.OA.6, 3.OA.7, 3.OA.8, 3.OA.9, 3.NBT.3	

DO

(Procedural, Application, Extended Thinking)

Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers, e.g., interpret 5 x 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 x 7.* **CC.3.OA.1**

• Understand and write story problems for multiplication equations. E.g. write a story problem for 5 x 7.

2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 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.* **CC.3.OA.2**

• Understand and write story problems for division equations. E.g. write a story problem for 56 divided by 8.

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.1

• Solve multiplication and division word problems that involve equal groups, arrays, and area with products up to 100. **CC.3.OA.3**

• Use drawings and equations to represent multiplication and division word problems.

• Write multiplication and division equations with a symbol for the unknown.

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 = ?.* **CC.3.OA.4**

• Solve multiplication and division problems with the unknown in any position.

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

5. Apply properties of operations as strategies to multiply and divide.2

6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* **CC.3.OA.6** *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.)* **CC.3.OA.5**

-Use fact families to solve multiplication and division problems.

Multiply and divide by 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. **CC.3.OA.7**

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

8. Solve two-step word problems using the four operations. 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.3

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.* **CC.3.OA.9**

Use place value understanding and properties of operations to perform multi-digit arithmetic.4

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. **CC.3.NBT.3**

CONNECTIONS TO OTHER DOMAINS

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

7. Relate area to the operations of multiplication and addition. **CC.3.MD.7**

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. **CC.3.MD.7b**

c. 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. **CC.3.MD.7c**

• Use arrays to model the distributive property of multiplication.

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

2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).5 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.

Represent and interpret data.

CC.3.MD.2

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. 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.* **CC.3.MD.3**

GRADE THREE

MATHEMATICS COMMON CORE STANDARDS 3.NBT.1, 3.NBT.2, OA.8, OA.9	ADDITION AND SUBTRACTION (Combined using standards from 3 domains: NBT, OA, and MD)
KNOW *(Factual)*	DO *(Procedural, Application, Extended Thinking)*
Notation: • Expanded notation for numbers up to 1000. • How to record addition and subtraction strategies using number lines and/or equations. • A letter can be used to stand for an unknown quantity. **Strategies** (CC.3.NBT.2)**:** • Partial sums for addition. • Adding up and subtracting back (in large chunks) for subtraction. • Creating an equivalent expression (also called compensation for addition and constant difference for subtraction). • Other place value strategies **Models/Representations:** • Open number line (for thinking about and recording addition and subtraction strategies.) • Bar graph or picture graph • Scaled bar graph or picture graph • Addition table • Multiplication table **Concepts/Big ideas:** • Rounding is a formal way of estimating. (CC.NBT.1) • When adding numbers the order of the addends does not matter. E.g., 7 + 10 = 10 + 7. (Commutative property). • Numbers can be decomposed, recomposed, & re-ordered to make adding more efficient. E.g., 8 + 5 = 8 + (2+3)= (8+2) +3= 10+3=13. (Associative property of addition.) (CC.3.NBT.2) • Addition and subtraction are inverse operations. (CC.3.NBT.2) • A letter can be used to stand for an unknown quantity. (CC.3.OA.8)	**Use place value understanding and properties of operations to perform multi-digit arithmetic.7** 1. Use place value understanding to round whole numbers to the nearest 10 or 100. **CC.3.NBT.1** 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. **CC.3.NBT.2** • Break 2 and 3 digit numbers into their place value components. • Use strategies such as partial sums for addition, adding up and subtracting back (in large chunks) for subtraction, and/or the regrouping algorithms for addition and subtraction. **Solve problems involving the four operations, and identify and explain patterns in arithmetic.** 8. Solve two-step word problems using the four operations. 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.8 • Write equations to represent two-step word problems, e.g. (4 x 10) + 32 = ___. **CC.3.OA.8** • Represent two-step missing addend problems with a letter for the unknown quantity, e.g. 72 = (4 x 10) + *n*. 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.* **CC.3.OA.9** • Students might observe that when counting by 9 (starting at any number) the tens digits increases by 1 and the ones digits decreases by 1. This can be explained by reasoning that adding 9 is equal to adding 10 and subtracting 1. **Connections to other Domains and/or Clusters:** **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 number on a number line diagram. **CC.3.MD.1** 2. Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. 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. **CC.3.MD.2** **Represent and interpret data.** 3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw bar graph in which each square in the bar graph might represent 5 pets.* **CC.3.MD.3**
UNDERSTAND *(Conceptual)* The value of a digit in our number system is determined by its place value position. Numbers can be decomposed and recomposed into component parts to add and subtract multi-digit numbers efficiently.	

GRADE THREE

MATHEMATICS	NUMBER & OPERATIONS - FRACTIONS
COMMON CORE STANDARDS	
3.G.2, 3.NF.1, 3.NF.2, 3.NF.2a-b, 3.NF.3a-d	

	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
Notation: • Fractions are written as *a/b* where the denominator of the fraction indicates the *size of the parts* (the unit fraction it is made of) and the numerator indicates *how many* of those parts are being considered. (CC.3.NF.1) **Models:** Fractions can be represented • As equal areas of a region. • As points on a number line. **Concepts/Big ideas:** • The whole on a number line is the interval or space between 0 and 1**.** (CC.NF.2a) • If the distance on a number line between 0 and 1, is divided into *b* equal intervals, then each interval has a size of 1/*b.* (E.g., if the space on a number line is divided into 4 equal intervals, then each interval represents ¼ of the distance between 0 and 1.) (CC.3.NF.2a) • When writing fractions on number lines, a fraction a/*b* should be placed a/*b* of the distance from 0 to 1. (E.g., ¼ should be placed on a number line at the point that is ¼ of the way from 0 to 1 and 2/3 should be placed at the point that is 2/3 of the distance from 0 to 1.) (CC.3.NF.2a &b) • Two fractions are equivalent (equal) if they are the same size or the same point on a number line. **CC.3.NF.3a** • Whole numbers can be written as fractions with a denominator of 1. (3.NF.3c) • Fractions with the same numerator and denominator are equal to 1. (3.NF.3c) • The size of a fractional part is relative to the size of the whole. (1/2 of a pizza is bigger than 1/2 of a cookie). (3.NF.3d) • When comparing the size of two different fractions, one must assume that the wholes are the same size. (3.NF.3d)	** All work with fractions in 3rd grade is limited to fractions with denominators 2, 3, 4, 6, and 8.* **Reason with shapes and their attributes.** **1.** Partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole. **CC.3.G.2** **Develop understanding of fractions as numbers.** **2.** Understand a fraction as a number on number line; represent fractions on a number line diagram **CC.3.NF.2** a**.** Represent a fraction 1/b on a number line diagram by defining the interval between 0 and 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 on the number line. **CC.NF.2a** • Correctly place unit fractions on unmarked number lines. b. Represent a fraction 1/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. **CC.NF.2b** • Correctly place non-unit fractions between 0 and 1 on unmarked number lines. • Student should use tick marks to indicate equal intervals. **3.** Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. **CC.3.NF.3.** 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. **CC.3.NF.3b** • Recognize simple equivalent fractions with denominators 2, 3, 4, 6, and 8. • Generate simple equivalent fractions with denominators 2, 3, 4, 6, and 8. • Use visual fraction models to prove equivalence. c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form of 3 = 3/1; recognize that 6 = 6/1, locate 4/4 and 1 at the same point on a number line diagram.* **CC.3.NF.3c** 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. **CC.3.NF.3d** • Compare fractions with the same numerators by reasoning about their size (e.g. ¾ is greater than 3/6 because ¼ pieces are larger than 1/6 pieces) and justify the answer using visual models. • Compare fractions with the same denominators by reasoning about their size (e.g.¾ is greater than 2/4 because ¾ refers to more ¼ pieces) and justify the answer visual models. **Connections to other Domains &/or Clusters:** **Represent and interpret data.** 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. **CC.3.MD.4** • Measure lengths with a ruler to the half inch or fourth of an inch. • Make line plots with scales marked off in whole units, half units, and quarter units.
UNDERSTAND *(Conceptual)*	
Fractions are a special type of numbers. • They refer to parts of wholes. • They fall between whole numbers on a number line. Unit fractions are the building blocks of all other fractions. • A unit fraction is a quantity. • Unit fractions refer to "1 out of ___ equal parts". (CC.3.NF.1) • Non-unit fractions are the sum of unit fractions (e.g. 3/5 = 1/5 + 1/5 + 1/5) (CC.3.NF.1) (Do we want something about the magnitude of fractions? Knowing that 1/8 is smaller than 1/3)	

GRADE THREE

MATHEMATICS COMMON CORE STANDARDS 3.MD.1, 3.MD.2, 3.MD.3, 3.MD4	MEASUREMENT AND DATA (TIME, LIQUID, VOLUME, MASS & GRAPHING)
KNOW *(Factual)*	DO *(Procedural, Application, Extended Thinking)*
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 ¼, 3½, 3 3/4 4,4 ¼,4 ½, etc) It is essential to include the unit when communicating measurement data. One interval on a scaled bar graph represents a larger quantity. One picture on a scaled picture graph represents a larger quantity. Bar graphs, picture graphs, and line plots provide opportunities to make comparisons.	**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. **CC.3.MD.1** 2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).9 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.10 **Represent and interpret data. CC.3.MD.2** 3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. 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.* **CC.3.MD.3** 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. **CC.3.MD.4** Use understanding of fractions on a number line to understand fractions on a ruler. **Connections to other Domains and/or Clusters:** **Represent and solve problems involving multiplication and division.** 5. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total 9 Excludes compound units such as cm3 and finding the geometric volume of a container. 10 Excludes multiplicative comparison problems (problems involving notions of "times as much"; see Glossary, Table 2 in CCSS). 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.* **CC.3.OA.1** 6. 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.11 **Develop understanding of fractions as numbers. CC.3.OA.3** 2. Understand a fraction as a number on the number line; represent fractions on a number line diagram. **CC.3.NF.2** 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. **CC.3.NF.2a** 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. **CC.3.NF.2b**
UNDERSTAND *(Conceptual)*	
Standard units enable people measure data in the same way. Data can be organized, represented, & interpreted in multiple ways for a variety of purposes.	

GRADE THREE

MATHEMATICS	GEOMETRIC MEASUREMENT- AREA & PERIMETER
COMMON CORE STANDARDS	
3. MD.5, 3.MD.6, 3.MD.7a-d, 3.MD.8	

KNOW	DO
(Factual)	*(Procedural, Application, Extended Thinking)*
Area covers: **5b**. 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. **CC.3.MD.5b** Perimeter is the distance around a figure. Strategies for finding area and perimeter use related to multiplication and addition. Strategies for finding Area: • Counting • Repeated addition • Multiplication of length by width • Decomposing into more than one rectangle Rectangles can have the same perimeter and different areas or the same areas and different perimeter.	**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. **CC.3.MD.5** 6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). **CC.3.MD.6** 7. Relate area to the operations of multiplication and addition. **CC.3.MD.7** 1. 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. **CC.3.MD.7a** 2. 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. **CC.3.MD.7b** 3. 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* × *b* and *a* × *c*. Use area models to represent the distributive property in mathematical reasoning. **CC.3.MD.7c** 4. 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. **CC.3.MD.7d** **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. **CC.3.MD.8** • Investigate the relationship of area and perimeter when rectangles have the same perimeter and different areas or the same area and different perimeters. **Connections to other Domains and/or Clusters:** **Represent and solve problems involving multiplication and division.** 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.[12] **Understand properties of multiplication and the relationship between multiplication and division. CC.3.OA.3** 5. Apply properties of operations as strategies to multiply and divide.[13] *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.)* **CC.3.OA.5**
UNDERSTAND	
(Conceptual)	
Area and perimeter are attributes used to describe and measure 2D figures. **5a.** 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. **CC.3.MD.5a**	

GRADE THREE

MATHEMATICS COMMON CORE STANDARDS 3.G.1, 3.G.2	GEOMETRY -REASON WITH SHAPES & THEIR ATTRIBUTES
KNOW *(Factual)*	DO *(Procedural, Application, Extended Thinking)*
Shapes can be sorted according to their attributes. Quadrilaterals are polygons with four sides. Rectangles, rhombi, and squares are a particular type of quadrilateral (parallelograms).	**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. **CC.3.G.1** • Identify rhombus, rectangle, square, etc as examples of quadrilaterals. • Draw examples of quadrilaterals that do not belong to any subcategory (not rhombi, rectangles, or squares, etc) such as trapezoids and/ or various sizes and shapes of convex and concave quadrilaterals.)
UNDERSTAND *(Conceptual)*	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.* **CC.3.G.2** -This standard should not be taught in isolation, but in conjunction with fractions.
Shapes in different categories may share attributes and the shared attributes can define a larger category.	**Connections to other Domains &/or Clusters:** **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*. **CC.3.NF.1**