Third Grade Instructional Framework

Cluster 1	**Building Mathematical Community & Understanding Equal Groups**
Cluster 2	**Using Data to Solve Problems**
Cluster 3	**Stories with Addition and Subtraction**
Cluster 4	**Making Sense of Multiplication and Division**
Cluster 5	**Reasoning with their Shapes and Attributes**
Cluster 6	**Applying the Operations to Area and Perimeter**
Cluster 7	**Understanding Fractions as Parts of a Whole**
Cluster 8	**Using Tools to Measure Length, Weight, and Capacity**
Cluster 9	**Understanding Time**

Introduction

The purpose of this document is to connect and sequence mathematical ideas to enable teachers to plan learning opportunities for students to develop a coherent understanding of mathematics. **Clusters** and sequencing are designed to foster students' meaning making of the connections among mathematical ideas and procedures. This meaning making occurs over time. Therefore, the concepts are included in multiple clusters with increasing depth. They build across the year beginning with conceptual understanding and moving toward procedural fluency.

Each cluster includes a list of related **content standards** and a range of **suggested duration**. Standards indicate the mathematics expectations of students by the end of the school year. Standards are introduced and developed throughout the year, so the fact that a content standard is listed in a particular cluster does not indicate that it is to be mastered in the cluster. In some clusters, strikethroughs in the content standards denote the portion of the standard that will be taught later. In other clusters, the full standard appears, but suggestions about the intended focus are noted in the cluster descriptions. Because standards may be included in clusters long before mastery is expected, formative assessment is an essential tool for instructional planning and reporting student progress. This assessment naturally occurs as teachers elicit students' mathematical thinking and reasoning while doing mathematics.

Particular **Standards for Mathematical Practice** are indicated in bold for each cluster. The suggestions are a guide for teachers. While the bolded practices may lend themselves particularly well to the cluster's content, this does not imply that they are the only practices students will use. Students doing rich mathematical tasks will naturally engage in many mathematical practices as they do mathematics. During instruction teachers may observe and decide to highlight the other practices students are using beyond those bolded in the cluster.

Each cluster includes a section called **"What is the mathematics?"** that describes the significant concepts and connections within the standards necessary for students to make

sense of and use the mathematics. A second section called **"Important Considerations"** provides guidance based on student learning progressions as well as ideas and models for teaching within problem-solving situations. Problem-solving and mathematical reasoning define what it means to do mathematics. Rich tasks (including word problems) provide students with concrete contexts to use as they are introduced to new mathematics. Later, work within such tasks allows students to develop understanding and eventually to demonstrate mastery. Rich tasks with multiple entry and exit points allow for natural differentiation of instruction and are accessible for all students.

The initial cluster at each grade includes a focus on **building mathematical community**. Learning mathematics involves productive struggle during problem-solving and meaningful discourse as students share strategies and explain their thinking. This requires individual students to have a mathematical mindset, a belief that they can learn and do mathematics, so they will take risks when solving non-routine tasks. Collectively, students must share ideas publicly as they critique mathematical ideas with peers and teacher. A safe community where mistakes and struggles are valued as learning opportunities is essential. Mathematical norms about how students do and talk about mathematics need to be explicitly established in the same way that other routines and expectations are introduced at the beginning of a school year.

Classroom Routines:
- Incorporating classroom routines focused on mathematical content can be an effective way to address standards throughout the year (ex. number talks, subitizing, telling time, estimation activities; Same or different?; Which one doesn't belong?)

Cluster 1: Understanding Equal Groups

***Duration*:** 3-4 weeks

Content Standards:
This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. *Please note that strikethroughs represent parts of standards that are addressed in a different cluster.* Additionally, *please note the recommendations in the Important Considerations section of this cluster.*

NC.3.OA.1
For products of whole numbers with two factors up to and including 10:
- Interpret the factors as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

NC.3.OA.3
Represent, interpret, and solve one-step problems involving multiplication and division.
- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction ~~and/or equations with a symbol for the unknown number to represent the problem~~.

Supporting Standards:
NC.3.OA.2
For whole-number quotients of whole numbers with a one-digit divisor and a one-digit quotient:
- Interpret the divisor and quotient in a division equation as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition or subtraction, and decomposing a factor.

NC.3.OA.9: Interpret patterns of multiplication on a hundreds board and/or multiplication table.

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.**

What is the mathematics?

The focus of this cluster is 1) building an effective math environment, and 2) representing situations that involve equal groups, including simple story problems with equal groups.

Consider the following elements when preparing for an effective math environment:

1.) Develop mathematicians with positive attitudes about **their** ability to **do** mathematics by:

- Creating opportunities to develop an appreciation for mistakes
- Seeing mistakes as opportunities to learn
- Teaching students to take responsibility for their learning

2.) Develop mathematicians who **respect others** by:

- Demonstrating acceptance, appreciation, and curiosity for different ideas and approaches
- Establishing procedures and norms for productive mathematical discourse
- Consider other solution paths

3.) Develop mathematicians with a **mindset for problem solving** by:

- Encouraging student authority and autonomy when problem solving.
- Emphasizing questioning, understanding, and reasoning about math, **not** just doing math for the correct answer.
- Asking follow-up questions when students are both right and wrong.
- Allowing students to engage in productive struggle and moving them along by questioning, not telling.

The second focus of this cluster builds on second-grade work when students worked with equal groups to build a foundation for multiplication (skip counting with 2, 5, and 10 and repeated addition). During this cluster, students are formally introduced to the meaning of multiplication and the symbolic notation for multiplication. The emphasis is on context and story problems (not merely equations); therefore, 3.OA.1 and 3.OA.2 are addressed through story problems.

Students will:

- Develop conceptual understanding of multiplication by solving story problems that involve equal groups (a number of groups with an equal number of items in each group).
- Use arrays and repeated addition to model the story problems.
- Write a multiplication equation to represent story problems.
- Develop conceptual understanding of division by solving story problems that involve the number of groups unknown or the size of the groups unknown (formal symbolic division notation will not be introduced until Cluster 4).
- Understand the relationship between multiplication and division through story problems (but formal symbolic notation will not be introduced until Cluster 4).
- Be fluent with multiplication facts with 2, 5, and 10 as a factor.
- Share their thinking by communicating their reasoning and sharing their solutions.

Important Considerations:

- This is one of two clusters in 3rd grade that addresses multiplication. Story problems are the emphasis in this cluster to build the “groups of” meaning of multiplication.
- Multiplication and division are the major work of the grade-level standards. By starting the year with developing understanding of the “equal groups” interpretation of multiplication, this foundation can be used throughout the year in other units of instruction as well as during possible daily routines (examples of routines are provided at the front of this document).

- Beginning the year with "equal groups" also provides students who may need more work with addition and subtraction more time with single and double-digit numbers before they return to the addition and subtraction of three-digit numbers in Clusters 2 and 3.
- Students should represent problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, or using objects. Students will need many opportunities to develop mathematical representations of story problems. After students work with concrete representations of equal-groups story problems, students can be introduced to the symbolic notation of multiplication and write multiplication equations to match situations.
- This cluster is connected to skip counting by 2s, 5s, and 10s from second grade. This connection can be made by asking students to look for real items that occur in groups of 2s, 5s, or 10s (e.g., wheels on a bike, fingers on a hand). Through experiences finding and counting groups of 2s, 5s, and 10s and connections to skip counting from 2nd grade, many students will be fluent with for 2s, 5s, and 10s at the end of this cluster.
- In this cluster, students are not expected to master other multiplication facts. They will use arrays, models, and repeated addition or repeated subtraction to develop an understanding of multiplication.
- Symbolic division equations are not introduced in this cluster, but the students will understand the concept by fair sharing and the relationship between multiplication and division. These experiences lay the foundation for Cluster 4.

Cluster 2: Using Data to Solve Problems

Duration: 1-2 weeks

Content Standards:
This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. *Please note that strikethroughs represent parts of standards that are addressed in a different cluster. Additionally, please note the recommendations in the Important Considerations section of this cluster.*

NC.3.MD.3
Represent and interpret scaled picture and bar graphs:
- Collect data by asking a question that yields data in up to four categories.
- Make a representation of data and interpret data in a frequency table, scaled picture graph, and/or scaled bar graph with axes provided.
- Solve one and two-step "how many more" and "how many less" problems using information from these graphs

Supporting Standards:
NC.3.NBT.2
Add and subtract whole numbers up to and including 1,000.
- Use estimation strategies to assess reasonableness of answers.
- Model and explain how the relationship between addition and subtraction can be applied to solve addition and subtraction problems.
- Use expanded form to decompose numbers and then find sums and differences.

NC.3.OA. 8 Solve two-step word problems using addition, subtraction, ~~and multiplication,~~ representing problems using equations with a symbol for the unknown number.

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.

What is the mathematics?
Data work in Grades K-5 builds foundations for the study of statistics and probability in Grades 6 and beyond. This work includes solving problems that involve addition, subtraction, and multiplication, thereby allowing students to strengthen and apply what they are learning in regard to computation.

Students will:
- Ask questions that involve up to four categories and collect data.
- Represent the data in frequency table, picture graph, or bar graph.
- Interpret data displayed in a frequency table, picture graph, or bar graph.
- Use addition, subtraction, and multiplication to solve **one-step** "how many more" and "how many less" problems using information from these graphs.
- Use addition and subtraction to solve **two-step** "how many more" and "how many less" problems using information from these graphs.

- Share their thinking by communicating their reasoning and sharing their solutions.

This cluster allows students to work with the concept of scale that applies to their previous unit of working with equal groups. Students draw picture graphs in which each picture represents more than one object, and they draw bar graphs in which the height of a given bar in tick marks must be multiplied by the scale factor in order to yield the number of objects in the given category. This connects with the emphasis on multiplication in this grade.

- At the end of Grade 3, students can draw a scaled picture graph or a scaled bar graph to represent a data set with several categories (four or fewer categories).
- In students' work with data, context is important and provides meaning to the mathematics, allowing integration with science, social studies, health, and other subjects.

This cluster also includes an emphasis (as a supporting standard) on addition and subtraction within 1000. This focus provides students the opportunity to practice some of the skills they acquired in second grade when they were also expected to add and subtract within 1000. Additionally, their work with addition and subtraction will continue in the next cluster (Cluster 3). Therefore, by answering interpretive questions about data displays in Cluster 2, they can simultaneously practice and apply their addition and subtraction computational skills.

Important Considerations:

- Drawing a bar graph in which each square in the bar graph represents a number other than one (say, 5 students) allows opportunities to use concepts and strategies from the previous cluster focused on equal groups.
- In this cluster, students use addition and subtraction to solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. At this point in the year, the work with data and the connection to NC.3.NBT.2 includes smaller numbers within the standard and builds to numbers up to 1,000..

Cluster 3: Stories with Addition and Subtraction

Duration: 4-5 Weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.NBT.2

Add and subtract whole numbers up to and including 1000.

- Use estimation strategies to assess reasonableness of answers.
- Model and explain how the relationship between addition and subtraction can be applied to solve addition and subtraction problems.
- Use expanded form to decompose numbers and then find sums and differences.

NC.3.OA.8

Solve two-step word problems involving addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number.

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.

What is the mathematics?

The focus of the work with addition and subtraction in third grade is to build on the conceptual understanding developed in second grade and to develop procedural fluency within 1000. Work with NC.3.OA.8 begins in this cluster as students have now had experiences with multiplication and can begin to think about two-step word problems with addition and subtraction and some simple multiplication.

Students will:

- Understand that the base-ten structure of our number system is useful when adding and subtracting numbers. They utilize and understand the place value of 3-digit numbers and work with numbers up to and including 1,000.
- Understand the relationship between addition and subtraction and how that relationship can be used to solve one- and two-step problems.
- Practice, refine, and develop efficient strategies to add and subtract and solve different types of story problems. They can use landmark numbers, decompose numbers to make friendly numbers, and choose an appropriate strategy for a specific set of numbers.
- Share their thinking about how to make sense of and solve problems.
- Solve two-step story problems

Important Considerations:

- Pay attention to the addition and subtraction problem types that students worked with in previous grades. Story contexts in third grade should include all addition and subtraction problem types and should include two-step story problems with addition and subtraction up to 1000 (ex. On Monday, 28 kindergartners and 34 first graders from Smith Elementary School

went to the science museum. On Tuesday, 19 second graders went to the museum. How many more students went to the museum on Monday than Tuesday?).

- Note that addition and subtraction is with models, whole number and decomposition strategies, and strategies based on place value. Mastery of the standard algorithm is not an expectation until fourth grade.
- Note that estimation is more than the procedure for rounding. Students use estimation to judge if their solution makes sense (ex. When adding 125 and 290, my answer should be less than 500. This does not require formal rounding to the nearest hundred. Rather a student might reason that a number less than 200 plus a number less than 300 is going to be less than 500.

Cluster 4: Making Sense of Multiplication and Division

Duration: 5-6 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.OA.1

For products of whole numbers with two factors up to and including 10:

- Interpret the factors as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

NC.3.OA.2

For whole-number quotients of whole numbers with a one-digit divisor and a one-digit quotient:

- Interpret the divisor and quotient in a division equation as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition or subtraction, and decomposing a factor.

NC.3.OA.3

Represent, interpret, and solve one-step problems involving multiplication and division.

- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.

NC.3.OA.6

Solve an unknown-factor problem, by using division strategies and/or changing it to a multiplication problem.

NC.3.OA.7

Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10.

- Know from memory all products with factors up to and including 10.
- Illustrate and explain using the relationship between multiplication and division.
- Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

NC.3.OA.8

Solve two-step word problems using addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number.

NC.3.OA.9

Interpret patterns of multiplication on a hundreds board and/or multiplication table.

NC.3.NBT.3

Use concrete and pictorial models, based on place value and the properties of operations, to find the product of a one-digit whole number by a multiple of 10 in the range 10–90.

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.**

What is the mathematics?

This cluster represents the major work of third grade focused on multiplication and division. The cluster builds on the work of Cluster 1 where students began their development of understanding the meaning of multiplication as equal groups through their work with story problems. Clusters 2 and 3 both included some supporting work on multiplication in the context of data displays (scaled picture graphs and bar graphs) and two-step story problems that involve equal-groups situations. The work in this cluster expands their previous work with multiplication to include division and the representation of division with symbolic notation. Their learning in this cluster also prepares them for the work of Cluster 6 focused on applying multiplication to area. Multiple clusters of work around multiplication (Clusters 1, 2, 4, and 6) allow students to gain conceptual understanding and build towards procedural fluency over the course of the year, giving them time to deeply learn the content.

Students will:

- Represent story problems that involve multiplication and division (equal groups) with a variety of models including arrays, pictures, repeated addition/subtraction, and equations.
- Interpret factors as the number of equal groups and the number of objects in each group.
- Understand that division can be used to find the number of objects in each group (partitive division, size of the groups unknown) or to find the number of groups (measurement division, number of groups unknown).
- Explore and apply properties of multiplication (commutative, associative, distributive) to solve multiplication and division problems involving single-digit factors. (See notes in the “Important Considerations” section about the properties).
- Describe patterns of multiplication on a hundreds board or a multiplication table.
- Solve two-step story problems involving addition, subtraction, and multiplication.
- Share their thinking by communicating their reasoning and sharing their solutions.

Important Considerations

- As in Cluster 1, the content of this cluster should be developed through the use of story problems. Building an understanding of the “equal groups” interpretation of multiplication and division means giving students many experiences with real problems that are situated in their own context and community.
- Multiplication and division are taught simultaneously to help students understand the relationship between them.
- While the use of representations will continue to support students’ solutions, writing an equation using a variable for the unknown number is included in this cluster.
- Arrays should be a central part of this unit including story problems that lend themselves to arrays (i.e., things arranged in rows).
- To develop the concept of the commutative property, focus on real situations. While 2 bags with 6 apples each looks different than 6 bags with 2 apples each, both situations have a total of 12 apples. It is important to acknowledge that 2 x 6 and 6 x 2 look different when we draw a

picture using the "groups of" interpretation, but what remains the same is the value of the two expressions.

- To develop the concept of the associative property, consider its natural use by your students to make numbers friendlier. For example, for 8 x 6, a student might think of the problem as 8 x 3 x 2, multiply 8 x 3 first, and then multiply by 2. By making 8 x 6 friendlier, the student has essentially changed the grouping of the factors: 8 x (3 x 2) = (8 x 3) x 2. When students use strategies like this one, these are opportunities to discuss the associative property in the context of its use rather than separately.
- Similar to the associative property, the distributive property can be discussed as it is used by students to solve problems. For example, for solving 7 x 8, a student might use 5 groups of 8 and 2 groups of 8 to figure out 7 groups of 8. By decomposing 7 and then multiplying by 8, the student is using the distributive property: (5 + 2) x 8 = (5 x 8) + (2 x 8). Array models on grid paper are useful for demonstrating the distributive property.
- Number talks can be an effective approach for trying to build computational fluency with multiplication facts. That is, number talks encourage students to use facts they know to help them with facts they don't know (similar to the examples provided in the three previous bullets).
- Students work two-step story problems with addition, subtraction, and multiplication. Since multiplication understanding is still developing, students could represent the situation with objects or pictures, and then write an equation to match their picture. Here are two possible story problems that serve as examples of stories that would be appropriate at this point in the year:
    - Katie and Valerie are giving one apple to each person in their class. Katie has three bags of apples with 4 apples in each bag, and Valerie has two bags of apples with 7 apples in each bag. How many apples do they have? If there are 25 total people in their class, do they have enough apples?
    - Raymond and Timothy each store their toy cars in a case. Raymond's case has two trays of cars with 8 cars in each tray. Timothy's case has four trays of cars with 6 cars in each tray. Who has more cars? How many more?
- Building fluency with multiplication facts started with facts with a factor of 2, 5, and 10 in Cluster 1 due to past experiences with skip counting. Building fluency with other facts should begin in this cluster as students use the facts they already know to learn new facts (ex. Students multiply by 4 by doubling twice, 7 x 4 = 7 x 2 x 2, or multiply by 8 by doubling three times, 7 x 8 = 7 x 2 x 2 x 2). Students will continue to apply these strategies in later grades (ex. 21 x 4 = 21 x 2 x 2).
- The goal to know facts from memory is an end-of-year target. Therefore, using number talks, games, and encouraging students to use facts they know to help them with facts they don't know should be ongoing with a focus on students' flexibility in mathematical thinking. Timed drill is not recommended for trying to build fluency.

Cluster 5: Reasoning with Shapes and their Attributes

Duration: 1-2 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.G.1

Reason with two-dimensional shapes and their attributes.

- Investigate, describe, and reason about composing triangles and quadrilaterals and decomposing quadrilaterals.
- Recognize and draw examples and non-examples of types of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.

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.

What is the mathematics?

Students spend time in this cluster reasoning about two-dimensional shapes and their attributes. It is essential that students internalize the attributes of quadrilaterals (particularly rectangles & squares) prior to exploring area and perimeter.

Students will:

- Investigate characteristics of and compose triangles and quadrilaterals.
- Decompose quadrilaterals.
- Recognize and draw both examples and non-examples of a variety of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.
- Communicate their reasoning by explaining their thinking and sharing their solutions.

Important Considerations

- This cluster was placed after multiplication & division to provide students a break after exploring multiple numeracy concepts and before moving into Area & Perimeter in Cluster 6.
- Without the solid understanding of the relationship between the sides of a quadrilateral, students will struggle to make sense of how area and perimeter are determined.
- When decomposing quadrilaterals, there are some opportunities to include discussions about fractions. For example, if a parallelogram (which includes rectangle, rhombus, and square) is divided into two congruent triangles along the diagonal, those two triangles are both ½ of the parallelogram. Another example is when both diagonals are drawn in a square or rhombus, four congruent triangles result. The four triangles are each ¼ of the square or rhombus.

Cluster 6: Applying the Operations to Area and Perimeter

Duration: 2-3 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.MD.5
Find the area of a rectangle with whole-number side lengths by tiling without gaps or overlaps and counting unit squares.

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

- 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.
- Multiply side lengths to find area of rectangles with whole-number side lengths in the context of problem solving, and represent whole-number products as rectangular areas in mathematical reasoning.
- Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the larger rectangle is the sum of the two smaller rectangles.

NC.3.MD.8
Solve problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length.

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**.**

What is the mathematics?

Students will spend time in this unit learning about and applying the concepts of area of rectangles and perimeter of various shapes (with an emphasis on quadrilaterals). They will work with manipulatives to tile the areas of various quadrilaterals to build a foundation of area and perimeter. The focus of this cluster is NOT about the "formula" for area or perimeter; the focus is on understanding.

Students will:

- Understand that area is the amount of space inside a two-dimensional figure (e.g., the amount of carpet needed to cover the floor of a bedroom).
- Understand that perimeter is the distance around a two-dimensional figure (e.g., the amount of fencing that is needed to build a dog pen).
- Differentiate between the meaning/representation of a linear unit to measure perimeter and a square unit to measure area.

- Find the perimeter of a polygon by adding the side lengths and find the length of an unknown side.
- Find the area of a rectangle by tiling it with squares and understand that "area" means the number of square units that are needed to cover the space.
- Understand why multiplying the length times the width results in the total number of squares needed to tile a given rectangle. Make a connection back to the understanding of multiplication as equal groups using the language of rows and columns to connect to area and to the commutative property. For example, there are 4 rows with 5 squares in each rows or 5 columns with four squares in each column. (Note: The focus in third grade is NOT on the formula. Avoid telling students that area is length times width).
- Understand the distributive property in the context of area models. That is, students will be able to draw a model and explain how finding the area of a 9x8 rectangle (9 rows with 8 squares in each row) can be found by finding the area of two rectangles, a 5x8 rectangle and a 4x8 rectangle.

Important Considerations

- This unit falls after "Reasoning with Shapes and Their Attributes" so that students have a firm understanding of the attributes of quadrilaterals. For example, if one side of a square is 5 inches long, students will apply their knowledge that all sides of a square are equal and can determine the correct area. It also comes after Clusters 1, 3 and 4, which builds students' understanding of addition and multiplication concepts, making problem solving with area and perimeter easier for students.
- The focus of instruction is building an understanding of area and perimeter or what they are conceptually. Using real scenarios (e.g., carpet, fencing) should help students develop understanding.
- When finding area using square tiles or multiplying length times width, connections should be made to arrays that students used in Cluster 4 to make sense of multiplication.
- The formula (length times width) should not be taught in third grade; the formula is part of the fourth grade standards. Instead, focus on why multiplying the length by the width gives the area in square units (e.g., in a rectangle that measures 7 inches by 6 inches, there are 7 rows of square inch tiles with 6 tiles in each row).
- Student re-visit the meaning of properties as they work with the area of rectangles. For example, a connection can be made to the commutative property as student discover the number of unit squares within a rectangle is the same regardless of whether you describe them in terms of rows or columns. As students find the area of a larger rectangle by partitioning it into two smaller rectangles and then finding the sum of their areas, a connection can be made to the multiplication strategy of decomposing a factor into addends (distributive property).
- In fourth grade, students investigate how shapes with the same area can have different perimeters and vice versa. While investigations into this concept will occur in depth in fourth grade, explorations in third grade to deepen students' understanding of the meaning of area and perimeter are helpful. For example, students might investigate rectangles that have an area of 16 square units and discover that those rectangles have different perimeters. Similarly, students might build rectangles that have a perimeter of 14 units and determine the areas can vary. This begins their understanding that while area and perimeter are related and impact each other, there is not a direct correlation between the two. In other words, all shapes with a given perimeter do not have the same area and vice versa (both common misconceptions).

Cluster 7: Understanding Fractions as Parts of a Whole

Duration: 4-5 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.NF.1

Interpret unit fractions with denominators of 2, 3, 4, 6, and 8 as quantities formed when a whole is partitioned into equal parts;

- Explain that a unit fraction is one of those parts.
- Represent and identify unit fractions using area and length models.

NC.3.NF.2

Interpret fractions with denominators of 2, 3, 4, 6, and 8 using area and length models.

- Using an area model, explain that the numerator of a fraction represents the number of equal parts of the unit fraction.
- Using a number line, explain that the numerator of a fraction represents the number of lengths of the unit fraction from 0.

NC.3.NF.3

Represent equivalent fractions with area and length models by:

- Composing and decomposing fractions into equivalent fractions using related fractions: halves, fourths and eighths; thirds and sixths.
- Explaining that a fraction with the same numerator and denominator equals one whole.
- Expressing whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

NC.3.NF.4

Compare two fractions with the same numerator or the same denominator by reasoning about their size, using area and length models, and using the >, <, and = symbols. Recognize that comparisons are valid only when the two fractions refer to the same whole with denominators: halves, fourths and eighths; thirds and sixths.

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.

What is the mathematics?

Throughout this unit, students develop an understanding that fractions are numbers and represent fractions using area and linear models and with symbolic notation. This work builds on the idea of partitioning (dividing) a whole into equal parts from first and second grades. First and second graders used the concept of partitioning and words for fractions (one half, two-thirds, four-fourths), and in third grade students represent fractional parts of equal parts of area, name each of the parts as a unit fraction, and learn that one fourth of the whole is one of four equal parts.

The study of fractions in third grade begins with learning that unit fractions (fractions with the

numerator 1) are formed by partitioning a whole into equal parts. It is important for students to see the unit fraction as the basic building blocks for all fractions. Students begin to understand that just as all whole numbers are made of a specific number of 1s, all fractions are made of a specific number of unit fractions.

The placement of fractions after geometry allows students to connect decomposing of rectangles and triangles to partitioning of shapes. Additionally, the measurement of length in the cluster that follows (Cluster 8) allows students to continue their exploration of linear models for fractions, in particular.

Students will:

- Understand the meaning of fractions and the ways fractions are represented. To anchor their understanding of fractions in a real-world context, third graders work with fractions with the following denominators: halves, fourths and eighths; thirds and sixths. Third graders use a variety of contexts (rectangles representing cakes, pattern blocks, and number lines) to represent equal parts of a whole.
- Understand that the unit fraction is the basic building blocks for all fractions. Just as all whole numbers are made of a specific number of 1s, all fractions are made of a specific number of unit fractions.
- Use area models to represent fractions as parts of a whole.
- Understand that the size of a fractional part is relative to the size of the whole.
- Use number lines to extend their understanding of the number system and focus on fractions as numbers. In the next cluster, students can use their understanding of fractions on a number line to represent measurements and solve problems, with inches, feet and yards, including fractions.
- Use fractions to represent numbers equal to, less than, and greater than one.
- Compare two fractions with the same numerator or same denominator by reasoning about their size, using area and length models, and using the >, <, and = symbols.
- Recognize that comparisons are valid only when the two fractions refer to the same whole.
- Share their thinking by communicating their reasoning and sharing their solutions.

Important Considerations

- This work connects to the prior cluster because partitioning of area models is related to partitioning of geometric shapes.
- Third grade is the first time students will see fractions written in numerical or symbolic form. Previous work in 2nd grade describe the shares using the words halves, thirds, half of, a third of, fourths, fourth of, quarter of.

Cluster 8: Using Tools to Measure Length, Weight, and Capacity

Duration: 2-3 weeks

Content Standards:

This list includes standards that will be addressed in this cluster, but not necessarily mastered, since all standards are benchmarks for the end of the year. Please note the recommendations in the Important Considerations section of this cluster for more information.

NC.3.MD.2

Solve problems involving customary measurement.

- Estimate and measure lengths in customary units to the quarter-inch and half-inch, and feet and yards to the whole unit.
- Estimate and measure capacity and weight in customary units to a whole number: cups, pints, quarts, gallons, ounces, and pounds.
- Add, subtract, multiply, or divide to solve one-step word problems involving whole number measurements of length, weight, and capacity in the same customary units.

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.

What is the mathematics?

This cluster is about measurement using customary measurements. Customary measurement is positioned at this point in the curriculum sequence because students can leverage their knowledge of linear models with fractions, part of the previous cluster, to measure length to the nearest ¼ and ½ inch. This cluster is not about measuring using non-standard units that students experienced in grades K and 1. However, it is worthwhile to begin the unit with reminding students of the rationale and need for standard units.

Students will:

- Estimate using customary units for: length (inches, feet, yards); weight (ounces and pounds); and capacity (cups, pints, quarts, and gallons).
- Measure length to the nearest ¼ and ½ inch.
- Measure weight and capacity to the nearest whole unit.
- Solve one-step story problems that involve whole-number measurements in the same customary units.

Important Considerations:

- Measurement is positioned at this point because it will be later in the school year, after most of the major work (multiplication, division, and fractions) has already been addressed.
- This cluster should start with attention to length because it directly builds on the previous cluster focused on fractions. Students learned about linear models for fractions so they can apply that knowledge in the context of measuring to the nearest ¼ and ½ inch.
- Since the third bullet in this standard focuses on one-step story problems involving all four operations, this allows students to further practice with different story problem types (e.g., add

to, take from, equal groups). Therefore, 3.OA.3 can be addressed at this point in the school year, too.

- In second grade, students explored the relationship between two different measurements of the same object using two different units (e.g., when measuring a table, use inches and feet and explore how it takes more inches than feet to measure the table). This idea can be explored in the context of measuring capacity or weight in third grade. For example, how many cups versus pints does a given bucket hold?
- To give a sense of the "size" of the units of measurement, use everyday objects that students know. For example, to give them a sense of a gallon, use an empty gallon milk jug.

Cluster 9: Time

Duration: 1-2 weeks

Content Standards:

NC.3.MD.1
Tell and write time to the nearest minute. Solve word problems involving addition and subtraction of time intervals within the same hour.

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.

What is the mathematics?
Time is a topic that is covered throughout the year as part of a classroom routine. This unit is created to culminate that work.
Students will

- Learn to tell and write time to the nearest minute.
- Solve word problems involving addition and subtraction of time intervals within the same hour.

Important Considerations:

- Time is a concept that is integrated throughout the school day and over the course of the year. It is best taught in real-world context for seeing relevance.
- This unit specifically engages students in problem solving around time.
- Time should be incorporated throughout the year as part of daily routines (e.g., asking students the time on the clock in the classroom, how many minutes has passed since we returned from lunch [within the same hour]).