Louisiana STUDENT STANDARDS MATHEMATICS

Grade 4

Louisiana Student Standards: Companion Document for Teachers 2.0

This document is designed to assist educators in interpreting and implementing the Louisiana Student Standards for Mathematics. Found here are descriptions of each standard which answer questions about the standard's meaning and application to student understanding. Also included are the intended level of rigor and coherence links to prerequisite and corequisite standards. Examples are samples only and should not be considered an exhaustive list.

Additional information on the Louisiana Student Standards for Mathematics, including how to read the standards' codes, a listing of standards for each grade or course, and links to additional resources, is available on the Louisiana Department of Education K-12 Math Planning Page. Please direct any questions to STEM@la.gov.

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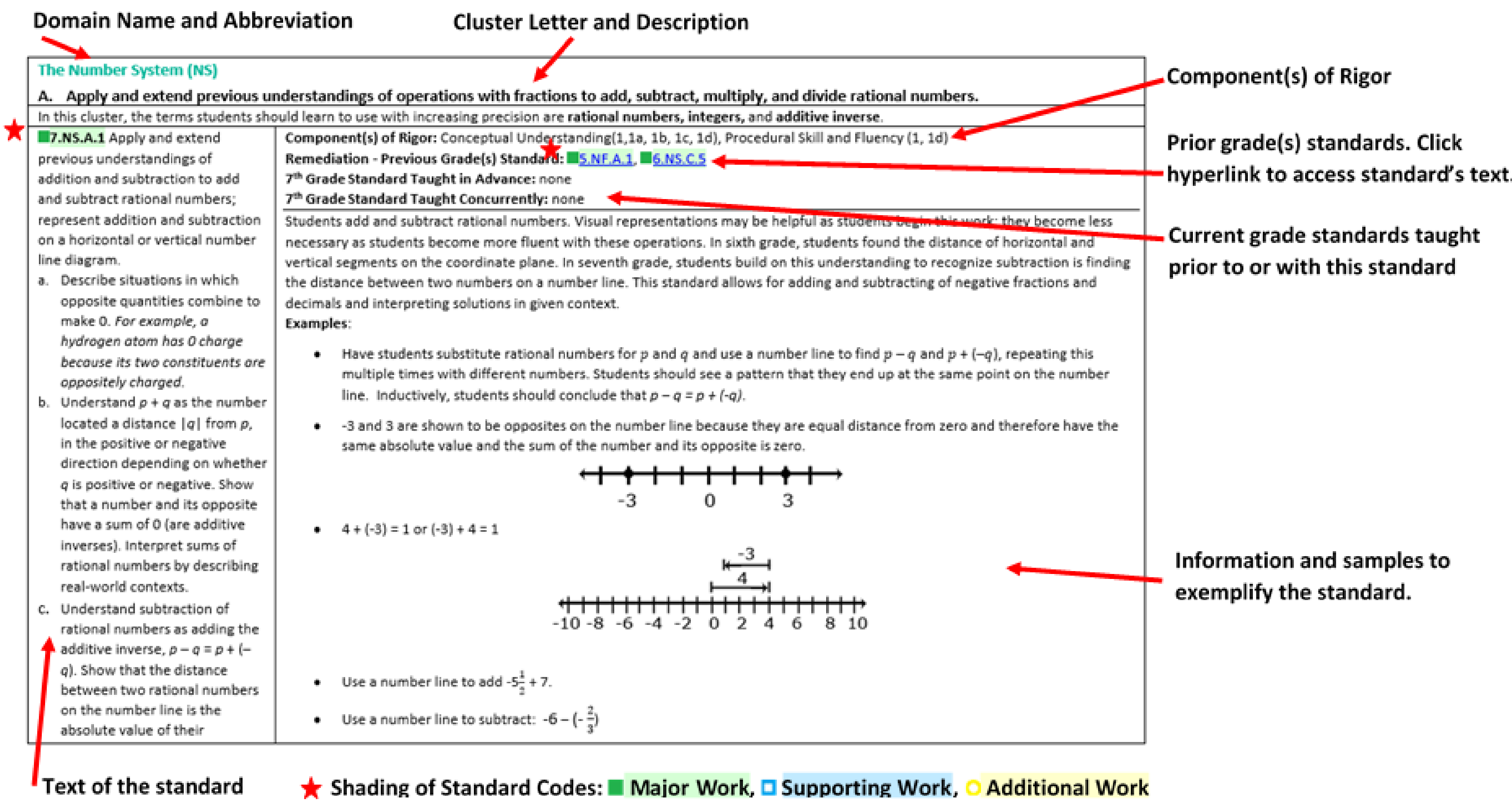
DEPARTMENT of EDUCATION
Louisiana Believes

Table of Contents

How-to-Read Guide

The diagram below provides an overview of the information found in all companion documents. Definitions and more complete descriptions are provided on the next page.



The Number System (NS)

A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

In this cluster, the terms students should learn to use with increasing precision are **rational numbers, integers,** and **additive inverse**.

7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* b. Understand $p + q$ as the number located a distance $\lvert q \rvert$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their	**Component(s) of Rigor:** Conceptual Understanding(1,1a, 1b, 1c, 1d), Procedural Skill and Fluency (1, 1d) **Remediation - Previous Grade(s) Standard:** 5.NF.A.1, 6.NS.C.5 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none Students add and subtract rational numbers. Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with these operations. In sixth grade, students found the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction is finding the distance between two numbers on a number line. This standard allows for adding and subtracting of negative fractions and decimals and interpreting solutions in given context. **Examples:** • Have students substitute rational numbers for p and q and use a number line to find $p - q$ and $p + (-q)$, repeating this multiple times with different numbers. Students should see a pattern that they end up at the same point on the number line. Inductively, students should conclude that $p - q = p + (-q)$. • -3 and 3 are shown to be opposites on the number line because they are equal distance from zero and therefore have the same absolute value and the sum of the number and its opposite is zero. -3 0 3 • 4 + (-3) = 1 or (-3) + 4 = 1 -3 4 -10 -8 -6 -4 -2 0 2 4 6 8 10 • Use a number line to add $-5\frac{1}{2} + 7$. • Use a number line to subtract: $-6 - (-\frac{2}{3})$

1. **Domain Name and Abbreviation:** A grouping of standards consisting of related content that are further divided into clusters. Each domain has a unique abbreviation and is provided in parentheses beside the domain name.
2. **Cluster Letter and Description:** Each cluster within a domain begins with a letter. The description provides a general overview of the focus of the standards in the cluster.
3. **Previous Grade(s) Standards:** One or more standards that students should have mastered in previous grades to prepare them for the current grade standard. If students lack the pre-requisite knowledge and remediation is required, the previous grade standards provide a starting point.
4. **Standards Taught in Advance:** These current grade standards include skills or concepts on which the target standard is built. These standards are best taught before the target standard.
5. **Standards Taught Concurrently:** Standards which should be taught with the target standard to provide coherence and connectedness in instruction.
6. **Component(s) of Rigor:** See full explanation on components of rigor.
7. **Sample Problem:** The sample provides an example how a student might meet the requirements of the standard. Multiple examples are provided for some standards. However, sample problems should not be considered an exhaustive list. Explanations, when appropriate, are also included.
8. **Text of Standard:** The complete text of the targeted Louisiana Student Standards of Mathematics is provided.

Classification of Major, Supporting, and Additional Work

Students should spend the large majority of their time on the ■ major work of the grade. ◘ Supporting work and, where appropriate, ○ additional work can engage students in the major work of the grade. Each standard is color-coded to quickly and simply determine how class time should be allocated. Furthermore, standards from previous grades that provide foundational skills for current grade standards are also color-coded to show whether those standards are classified as ■ major, ◘ supporting, or ○ additional in their respective grades.

Components of Rigor

The K-12 mathematics standards lay the foundation that allows students to become mathematically proficient by focusing on conceptual understanding, procedural skill and fluency, and application.

Conceptual Understanding refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful. It also allows students to connect prior knowledge to new ideas and concepts.

Procedural Skill and Fluency is the ability to apply procedures accurately, efficiently, and flexibly. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.

Application provides a valuable content for learning and the opportunity to solve problems in a relevant and a meaningful way. It is through real-world application that students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills.

Standards for Mathematical Practice

The Louisiana Standards for Mathematical Practice are expected to be integrated into every mathematics lesson for all students in grades K–12. Below are a few examples of how these practices may be integrated into tasks that students in grade 4 complete.

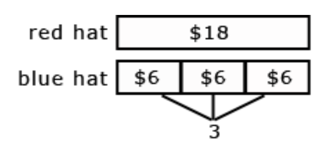
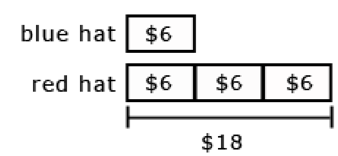
Louisiana Standards for Mathematical Practice (MP)	
Louisiana Standard	**Explanations and Examples**
4.MP.1 Make sense of problems and persevere in solving them.	In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different strategies when they have difficulty in solving a problem. They often will use another method to check their answers.
4.MP.2 Reason abstractly and quantitatively.	Fourth graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts.
4.MP.3 Construct viable arguments and critique the reasoning of others.	In fourth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.
4.MP.4 Model with mathematics.	Students experiment with representing problem situations in multiple ways, including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fourth graders should evaluate their results in the context of the situation and reflect on whether the results make sense.
4.MP.5 Use appropriate tools strategically.	Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper or a number line to represent and compare decimals and protractors to measure angles. They use other measurement tools to understand the relative size of units within a system and express measurements given in larger units in terms of smaller units.

Louisiana Standard	Explanations and Examples
4.MP.6 Attend to precision.	As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.
4.MP.7 Look for and make use of structure.	In fourth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial-products model). They relate representations of counting problems, such as tree diagrams and arrays, to the multiplication principal of counting. They generate number or shape patterns that follow a given rule.
4.MP.8 Look for and express regularity in repeated reasoning.	Students in fourth grade should notice repetitive actions in computation to make generalizations. Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Operations and Algebraic Thinking (OA)

A. Use the four operations with whole numbers to solve problems.

In this cluster, the terms students should learn to use with increasing precision are **multiplication/multiply, division/divide, addition/add, subtraction/subtract, equations, multiplicative comparison, additive comparison, unknown, remainders, reasonableness, mental computation, estimation,** and **rounding**.

Louisiana Standard	Explanations and Examples
4.OA.A.1 Interpret a multiplication equation as a comparison and represent verbal statements of multiplicative comparisons as multiplication equations, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7, and 7 times as many as 5.	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** 3.OA.A.1, 3.OA.A.3 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none A *multiplicative comparison* is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., "*a* is *n* times as much as *b*"). Students should be able to identify and verbalize which number is being multiplied and which number tells how many times. Students should be given opportunities to write and identify equations and statements for multiplicative comparisons. **Examples:** Have students interpret statements such as: • 9 × 8 = 72 *Sample response: 72 is 8 times as many as 9; 9 times as many as 8 is 72.*
4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (Example: 6 times as many vs 6 more than.) *Table 2 found in the Louisiana Student Standards for Mathematics has been added to the end of this document.	**Component(s) of Rigor:** Application **Remediation - Previous Grade(s) Standard:** 3.OA.A.3 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** 4.MD.A.1 Students need many opportunities to solve contextual problems. Table 2* includes the following multiplication problem: • A blue hat costs \$6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? In solving this problem, the student should identify \$6 as the quantity that is being multiplied by 3. The student should write the problem using a symbol to represent the unknown. (\$6 x 3 = ☐)  Table 2 includes the following division problem: • A red hat costs \$18 and a blue hat costs \$6. How many times as much does the red hat cost as the blue hat? In solving this problem, the student should identify \$18 as the quantity being divided into shares of \$6. The student should write the problem using a symbol to represent the unknown. (\$18 ÷ \$6 = ☐). 

4.OA.A.2 *continued*	When distinguishing multiplicative comparison from additive comparison, students should note that: • additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, "How many more?" • multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times as large as or as small as than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How many miles did Karen run?). A simple way to remember this is "How many times as much?" or "How many times as many?".
4.OA.A.3 Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. *Example: Twenty-five people are going to the movies. Four people fit in each car. How many cars are needed to get all 25 people to the theater at the same time?*	**Component(s) of Rigor:** Conceptual Understanding, Application **Remediation - Previous Grade(s) Standard:** 3.OA.D.8 **4th Grade Standard Taught in Advance:** 4.NBT.A.3, 4.NBT.B.6 **4th Grade Standard Taught Concurrently:** 4.MD.A.2 Students need many opportunities solving multi-step story problems using all four operations. An interactive whiteboard, document camera, drawings, words, numbers, and/or objects may be used to help solve story problems. **Example**: • Chris bought clothes for school. She bought 3 shirts for $12 each and a skirt for $15. How much money did Chris spend on her new school clothes? $3 \times \$12 + \$15 = a$ In division problems, the remainder is the whole number left over when as large a multiple of the divisor as possible has been subtracted. **Examples**: • Kim is making candy bags. There will be 5 pieces of candy in each bag. She had 53 pieces of candy. She ate 14 pieces of candy. How many full candy bags can Kim make now? (53 – 14 = 39, 39 ÷ 5 = 7 bags with 4 pieces of candy left over) • Kim has 28 cookies. She wants to share them equally between herself and 3 friends. How many cookies will each person get? (28 ÷ 4 = 7 cookies each) • There are 29 students in one class and 28 students in another class going on a field trip. Each car can hold 5 students. How many cars are needed to get all the students to the field trip? (12 cars, one possible explanation is 11 cars holding 5 students and the 12th holding the remaining 2 students 29 + 28 = 11 × 5 + 2) Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of solutions using various estimation strategies. Numerous estimation strategies are provided in *Teaching Computational Estimation: Concepts and Strategies*, written by by Barbara J. Reys, program coordinator for mathematics education at the University of Missouri and noted expert and author on the

4.OA.A.3 *continued*	topic. The article provides guidance starting at the bottom of page 3 to help students understand and use • front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts); • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate); • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values); and • friendly or compatible numbers that fit together easily.

<table>
<tr><td colspan="2">Operations and Algebraic Thinking (OA)
B. Gain familiarity with factors and multiples.</td></tr>
<tr><td colspan="2">In this cluster, the terms students should learn to use with increasing precision are multiplication/multiply, division/divide, factor pairs, factor, multiple, prime, and composite.</td></tr>
<tr><td>Louisiana Standard</td><td>Explanations and Examples</td></tr>
<tr><td>4.OA.B.4 Using whole numbers in the range 1–100,
a. Find all factor pairs for a given whole number.
b. Recognize that a given whole number is a multiple of each of its factors.
c. Determine whether a given whole number is a multiple of a given one-digit number.
d. Determine whether a given whole number is prime or composite.</td><td>Component(s) of Rigor: Procedural Skill and Fluency (4a), Conceptual Understanding (4b, 4c, 4d)
Remediation - Previous Grade(s) Standard: 3.OA.C.7
4th Grade Standard Taught in Advance: none
4th Grade Standard Taught Concurrently: none

Students should understand the process of finding factor pairs so they can do this for any number 1–100.
Example:
• Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12
Multiples can be thought of as the result of skip-counting by each of the factors. When skip-counting, students should be able to identify the number of factors counted (e.g., 5, 10, 15, 20, so there are 4 fives in 20).
Example::
• Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24
Multiples of factors of 24
1, 2, 3, 4, 5 … <u>24</u>
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, <u>24</u>
3, 6, 9, 12, 15, 18, 21, <u>24</u>
4, 8, 12, 16, 20, <u>24</u>
8, 16, <u>24</u>
12, <u>24</u>
<u>24</u>
Teacher Note:
To determine if a number between 1–100 is a multiple of a given one-digit number, some helpful hints include the following:
o all even numbers are multiples of 2
o all even numbers that can be halved twice (with a whole number result) are multiples of 4
o all numbers ending in 0 or 5 are multiples of 5
Example:
• Circle the numbers that are multiples of 3: 1, 3, 5, 6, 10, 12, 15, 20, 21, 25, 33, 42</td></tr>
</table>

4.OA.B.4 *(continued)*	**Teacher Note:** Prime vs. Composite o A prime number is a number greater than 1 that has only 2 factors, 1 and itself. o Composite numbers have more than 2 factors. **Example:** Students investigate whether numbers are prime or composite by o building rectangles (arrays) with the given area and finding which numbers have more than two rectangles (e.g., 7 can be made into only 2 rectangles, 1 x 7 and 7 x 1; therefore, it is a prime number). o finding factors of the number.

Operations and Algebraic Thinking (OA)

C. Generate and analyze patterns.

In this cluster, the terms students should learn to use with increasing precision are **pattern (number or shape)** and **pattern rule**.

Louisiana Standard	Explanations and Examples
4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.OA.D.9 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none

Patterns involving numbers or symbols either repeat or grow. Students need multiple opportunities creating and extending number and shape patterns. Numerical patterns allow students to reinforce facts and develop fluency with operations.

Patterns and rules are related. A pattern is a sequence that repeats the same process over and over. A rule dictates what that process will look like. Students investigate different patterns to find rules, identify features in the patterns, and justify the reason for those features.

Example:

Pattern	Rule	Feature(s)
3, 8, 13, 18, 23, 28, …	Start with 3, add 5	The numbers alternately end with a 3 or 8
5, 10, 15, 20 …	Start with 5, add 5	The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number. The numbers that end in 0 are products of 5 and an even number.

After students have identified rules and features from patterns, they need to generate a number or shape pattern from a given rule.

Example:

- Rule: Starting at 1, create a pattern that multiplies each number by 3. Stop when you have 6 numbers.

  Students write 1, 3, 9, 27, 81, 243. Students notice that all the numbers are odd. Some students might investigate this beyond 6 numbers. Another feature to investigate is the pattern in the differences of the numbers (3 - 1 = 2, 9 - 3 = 6, 27 - 9 = 18, etc.)

This standard calls for students to describe features of an arithmetic number pattern or shape pattern by identifying the rule with features that are not explicit in the rule. A t-chart is a tool to help students see number patterns.

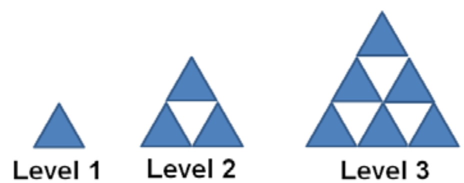
4.OA.C.5 *continued*

Example:
There are 4 beans in the jar. Each day 3 beans are added. How many beans are in the jar for each of the first 5 days?
Students create the table below.

Day	Operation	Beans
0	3 x 0 + 4	4
1	3 x 1 + 4	7
2	3 x 2 + 4	10
3	3 x 3 + 4	13
4	3 x 4 + 4	16
5	3 x 5 + 4	19

Example:
How many blue triangles are in each figure below? ______, _______, ________

How many blue triangles would be in the level 5 figure? Use a number pattern to determine your answer and explain the pattern.



Sample Student Response: 1, 3, 6. Level 5 would have 15 blue triangles. I saw you don't add the same number each time to get the next number in the pattern. You add 2 to 1 to get 3. You add 3 to 3 to get 6. So I added 4 to 6 and get 10 which means Level 4 would have 10 blue triangles. Then I added 5 to 10 and got 15 for Level 5. I added 2, then 3, then 4, and then 5 to the number I had before.

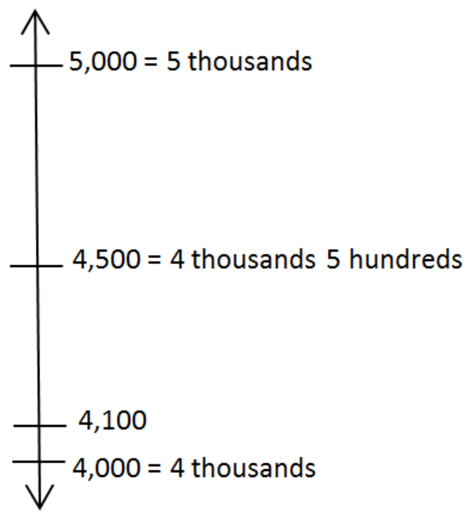
Number and Operations in Base Ten (NBT)

A. Generalize place value understanding for multi-digit whole numbers.

In this cluster, the terms students should learn to use with increasing precision are **place value, greater than, less than, equal to, ‹, ›, =, comparisons/compare, round, base-ten numerals (standard form), number name (written form), expanded form, inequality,** and **expression**.

Louisiana Standard	Explanations and Examples
4.NBT.A.1 Recognize that in a multi-digit whole number less than or equal to 1,000,000, a digit in one place represents ten times what it represents in the place to its right. *Examples: (1) recognize that 700 ÷ 70 = 10; (2) in the number 7,246, the 2 represents 200, but in the number 7,426 the 2 represents 20, recognizing that 200 is ten times as large as 20, by applying concepts of place value and division.*	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** 2.NBT.A.1 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none Students should be familiar with and use place value as they work with numbers. This standard calls for students to extend their understanding of place value related to multiplying and dividing by multiples of 10. In this standard, students should reason about the magnitude of digits in a number. Students should be given opportunities to reason and analyze the relationships of numbers that they are working with. Some activities that will help students develop understanding of this standard are as follows: • Compare the value of the 2 in the number 582 to the value of the 2 in the number 528. • Thousands and Millions of Fourth Graders: https://www.illustrativemathematics.org/content-standards/4/NBT/A/1/tasks/1808
4.NBT.A.2 Read and write multi-digit whole numbers less than or equal to 1,000,000 using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** none **4th Grade Standard Taught in Advance:** 4.NBT.A.1 **4th Grade Standard Taught Concurrently:** none There is no Grade 3 standard that focuses on reading and writing numbers. As a result, students may need to look back at 2.NBT.A.3 prior to engaging with this standard. This standard refers to various ways to write numbers. Students should have flexibility with the different number forms. Traditional expanded form is 285 = 200 + 80 + 5. Written form or number name for 285 is two hundred eighty-five. However, students should have opportunities to explore the idea that 285 could also be 28 tens plus 5 ones or 1 hundred, 18 tens, and 5 ones. In comparing 34,570 to 34,192, a student might say both numbers have the same number of 10,000s and the same number of 1,000s; however, the value in the 100s place is different so that is where I would compare the two numbers. To read numerals between 1,000 and 1,000,000, students need to understand the role of commas. Each sequence of three digits made by commas is read as hundreds, tens, and ones, followed by the name of the appropriate base-thousand unit (thousand, million, billion, trillion, etc.). Thus, 457,000 is read "four hundred fifty-seven thousand." The same methods students used for comparing and rounding numbers in previous grades apply to these numbers, because of the uniformity of the base-ten system. Students should also be able to compare two multi-digit whole numbers using appropriate symbols.

4.NBT.A.3 Use place value understanding to round multi-digit whole numbers, less than or equal to 1,000,000, to any place.	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** 3.NBT.A.1 **4th Grade Standard Taught in Advance:** 4.NBT.A.1, 4.NBT.A.2 **4th Grade Standard Taught Concurrently:** none This standard refers to place value understanding, which extends beyond an algorithm or procedure for rounding. **The expectation is that students have a deep understanding of place value and number sense and can explain and reason about the answers they get when they round.** Students should have numerous experiences using a number line and a hundreds chart as tools to support their work with rounding. When students are asked to round large numbers, they first need to identify which digit is in the appropriate place. **Example**: Round 76,398 to the nearest 1000. Since I needed to round to the nearest 1,000, I knew the answer is either 76,000 or 77,000. I knew that the halfway point between these two numbers is 76,500. Then I saw that 76,398 was between 76,000 and 76,500, so the rounded number would be 76,000. **Example:** Round 2368 to the nearest hundred. This will either be 2300 or 2400, since those are the two hundreds before and after 2368. I drew a number line and divided the space between 2300 and 2400 into 50s. I had to determine whether 2368 is closer to 2300 or 2400. Since 2368 is closer to 2400, this number should be rounded to 2400.

4.NBT.A.3 *continued*	Students may also use a vertical number line for rounding. Round to the nearest thousand 4,100 

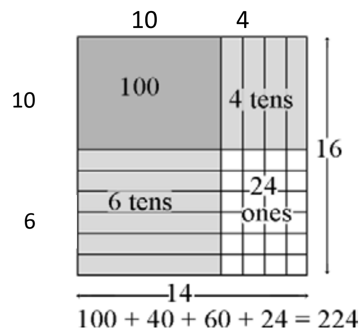
Number and Operations in Base Ten (NBT)

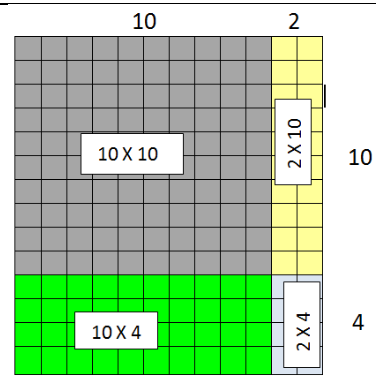
B. Use place value understanding and properties of operations to perform multi-digit arithmetic.

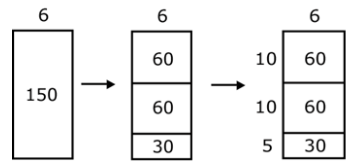
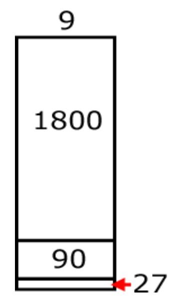
In this cluster, the terms students should learn to use with increasing precision are **add, addend, sum, subtract, difference, equation, strategies, properties of operations, algorithm, rectangular arrays, area model, multiply, divide, factor, product, quotient,** and **reasonableness**.

Louisiana Standard	Explanations and Examples
4.NBT.B.4 Fluently add and subtract multi-digit whole numbers with sums less than or equal to 1,000,000, using the standard algorithm	**Component(s) of Rigor:** Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.NBT.A.2 **4th Grade Standard Taught in Advance:** 4.NBT.A.1 **4th Grade Standard Taught Concurrently:** none Students build on their understanding of addition and subtraction, their use of place value, and their flexibility with multiple strategies to make sense of the standard algorithm. They continue to use place value in describing and justifying the processes they use to add and subtract. This standard refers to fluency, which means accuracy, efficiency (using a reasonable amount of steps and time), and flexibility (using a variety strategies). **This is the first grade level in which students are expected to be proficient at using the standard algorithm to add and subtract. However, other previously learned strategies are still appropriate for students to use.** In mathematics, an algorithm is defined by its steps and not by the way those steps are recorded in writing. With this in mind, minor variations in methods of recording standard algorithms are acceptable. As with addition and subtraction, students should use methods they understand and can explain. When students begin using the standard algorithm their explanations may be quite lengthy. After much practice with using place value to justify their steps, they will develop fluency with the algorithm. Students should be able to explain their steps either orally or in writing to help internalize the algorithm. • 3892 + 1567 Student explanation for this problem: 1. Two ones plus seven ones is nine ones. 2. Nine tens plus six tens is 15 tens. 3. I am going to write down five tens and think of the 10 tens as one more hundred. (Notates with a 1 above the hundreds column.) 4. Eight hundreds plus five hundreds plus the extra hundred from adding the tens is 14 hundreds. 5. I am going to write the four hundreds and think of the 10 hundreds as one more 1,000. (Notates with a 1 above the thousands column.) 6. Three thousands plus one thousand plus the extra thousand from the hundreds is five thousand.

4.NBT.B.4 *continued*	• 3546 - 928 Student explanation for this problem: 1. There are not enough ones to take 8 ones from 6 ones so I have to use one ten as 10 ones. Now I have 3 tens and 16 ones. (Marks through the 4 and notates with a 3 above the 4 and writes a 1 above the ones column to be represented as 16 ones.) 2. Sixteen ones minus 8 ones is 8 ones. (Writes an 8 in the ones column of answer.) 3. Three tens minus 2 tens is one ten. (Writes a 1 in the tens column of answer.) 4. There are not enough hundreds to take 9 hundreds from 5 hundreds so I have to use one thousand as 10 hundreds. (Marks through the 3 and notates with a 2 above it. (Writes down a 1 above the hundreds column.) 5. Now I have 2 thousand and 15 hundreds. 6. Fifteen hundreds minus 9 hundreds is 6 hundreds. (Writes a 6 in the hundreds column of the answer.) 7. I have 2 thousands left since I did not have to take away any thousands. (Writes 2 in the thousands place of answer.) **Teacher Note:** Students should know that it is mathematically possible to subtract a larger number from a smaller number but that their work with whole numbers does not allow this as the difference would result in a negative number.
4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.OA.B.5, 3.OA.C.7, 3.NBT.A.2, 3.NBT.A.3 **4th Grade Standard Taught in Advance:** 4.NBT.A.1 **4th Grade Standard Taught Concurrently:** none Students who develop flexibility in breaking numbers apart have a better understanding of the importance of place value and the distributive property in multi-digit multiplication. Students use base ten blocks, area models, partitioning, compensation (http://www.showme.com/sh/?h=4Li5Pm4) and other strategies when multiplying whole numbers. Students use words and diagrams to explain their thinking. They use the terms *factor* and *product* when communicating their reasoning. Multiple strategies enable students to develop fluency with multiplication and transfer that understanding to division. **Use of the standard algorithm for multi-digit multiplication is not an expectation until the 5th grade (5.NBT.B.5).** Another part of understanding general base-ten methods for multi-digit multiplication is understanding the role played by the distributive property. This allows numbers to be decomposed into base-ten units, products of the units to be computed, and then combined. By decomposing the factors into like base-ten units and applying the distributive property, multiplication computations are reduced to single-digit multiplications and products of numbers with multiples of 10, of 100, and of 1,000. Students can connect diagrams of areas or arrays to numerical work to develop understanding of general base-ten multiplication methods. Computing products of two two-digit numbers requires using the distributive property several times when the factors are decomposed into base-ten units.

4.NBT.B.5 *continued*	**Examples:** $36 \times 94 = (30+6) \times (90+4)$ $= (30+6) \times 90 + (30+6) \times 4$ $= 30 \times 90 + 6 \times 90 + 30 \times 4 + 6 \times 4.$ Use of place value and the distributive property are applied in the **scaffolded examples** below. • To illustrate 154 x 6 students use base-ten blocks or use drawings to show 154 six times. Seeing 154 six times will lead them to understand the distributive property, 154 x 6 = (100 + 50 + 4) x 6 = (100 x 6) + (50 x 6) + (4 x 6) = 600 + 300 + 24 = 924. • The area model shows the partial products.  Using the area model, students first verbalize their understanding: • 10 x 10 is 100 • 4 x 10 is 40 • 10 x 6 is 60, and • 4 x 6 is 24. They use different strategies to record this type of thinking. An array model is similar to an area model as one finds area by using square units. The array below models 12 x 14. 100 + 20 + 40 + 8 = 168.

4.NBT.B.5 *continued*	 Other strategies are shown below. 25 x24 400 (20 x 20) 100 (20 x 5) 80 (4 x 20) 20 (4 x 5) 600 25 x24 500 (20 x 25) 100 (4 x 25) 600
4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.OA.B.5, 3.OA.C.7, 3.NBT.A.2 **4th Grade Standard Taught in Advance:** 4.NBT.A.1, 4.NBT.B.5 **4th Grade Standard Taught Concurrently:** In fourth grade, students build on their third-grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context. **Examples**: **Using Base-ten Blocks**: Students build 260 with base-ten blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50. **Using Place Value:** 260 ÷ 4 = (200 ÷ 4) + (60 ÷ 4) **Using Multiplication:** 4 x 50 = 200, 4 x 10 = 40, 4 x 5 = 20; 50 + 10 + 5 = 65; so 260 ÷ 4 = 65 • **Using an Open Array or Area Model** After developing an understanding of using arrays to divide, students begin to use a more abstract model for division. This model connects to the algorithm that will be formalized in the sixth grade. It is based on use of the distributive property.

4.NBT.B.6 *continued*	o **Example:** 150 ÷ 6  1. Students make a rectangle and write 6 on one of its sides. They indicate that 150 could represent the area of the rectangle by writing 150 inside the rectangle. (Left diagram) 2. Students think of ways to rewrite 150: 60 + 60 + 30 = 150 and each addend is a multiple of 6. (Middle diagram) 3. Students think of the values shown in the middle diagram as areas of the small rectangles and use the area formula to find the missing lengths of the smaller rectangles. (Right diagram) 4. The area model on the right now shows that 25 x 6 = 150, so 150 ÷ 6 = 25. o **Example**: 1917 ÷ 9  A student's description of his or her thinking may be similar to the following: I need to find out how many 9s are in 1917. I know that 200 x 9 is 1800. So if I use 1800 of the 1917, I have 117 left. I know that 9 x 10 is 90. So if I have 10 more 9s, I will have 27 left. I can make 3 more 9s. I have 200 nines, 10 nines and 3 nines. So I made 213 nines. 1,917 ÷ 9 = 213.

Number and Operations—Fractions (NF)

A. Extend understanding of fraction equivalence and ordering.

In this cluster, the terms students should learn to use with increasing precision are **partition(ed), fraction, unit fraction, equivalent, expression, multiple, reason, denominator, numerator, comparison/compare, ‹, ›, =,** and **benchmark fraction**.

Louisiana Standard

4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.)

Explanations and Examples

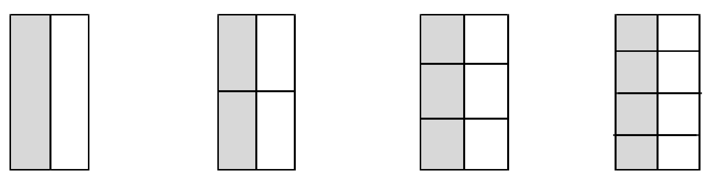
Component(s) of Rigor: Conceptual Understanding, Procedural Skill and Fluency
Remediation - Previous Grade(s) Standard: 3.NF.A.3
4th Grade Standard Taught in Advance: 4.OA.A.2
4th Grade Standard Taught Concurrently: none

This standard extends the work in third grade by using additional denominators (5, 10, 12, and 100). Students use visual models to generate equivalent fractions.

All the models show 1/2. The second model shows 2/4 but also shows that 1/2 and 2/4 are equivalent fractions because their areas are equivalent. When a horizontal (or vertical) line is drawn through the center of the model, the number of equal parts doubles and size of the parts is halved.

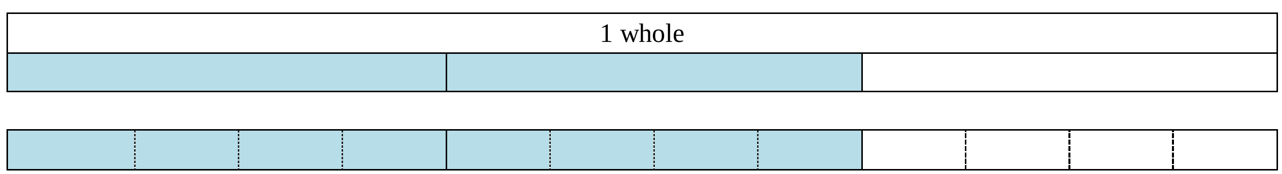
Students will begin to notice connections between the models and fractions because of the way that the parts and wholes are counted. They begin to generate a rule for writing equivalent fractions.

$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$



$\frac{1}{2}$ $\quad$ $\frac{2}{4} = \frac{2 \times 1}{2 \times 2}$ $\quad$ $\frac{3}{6} = \frac{3 \times 1}{3 \times 2}$ $\quad$ $\frac{4}{8} = \frac{4 \times 1}{4 \times 2}$

Using fraction strips to show that $\frac{2}{3} = \frac{8}{12}$.



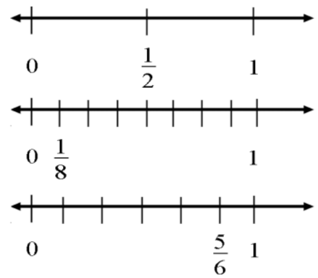
$\frac{2}{3} = \frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $1/2$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.)

Component(s) of Rigor: Conceptual Understanding
Remediation - Previous Grade(s) Standard: none
4th Grade Standard Taught in Advance: 4.NF.A.1
4th Grade Standard Taught Concurrently: none

This standard calls students to compare fractions by creating visual fraction models, finding common denominators or numerators, or comparing to a benchmark fraction. **Students' experiences should focus on visual fraction models rather than algorithms.** Students should learn to draw fraction models to help them compare. Students must also recognize that they must consider the size of the whole when comparing fractions (i.e., $\frac{1}{2}$ and $\frac{1}{8}$ of two medium pizzas are very different from $\frac{1}{2}$ of one medium and $\frac{1}{8}$ of one large).

- Fractions may be compared using $\frac{1}{2}$ as a benchmark.



Possible student thinking by using benchmarks:

- $\frac{1}{8}$ is smaller than $\frac{1}{2}$ because when 1 whole is cut into 8 pieces, the pieces are much smaller than when 1 whole is cut into 2 pieces.

Possible student thinking by creating common denominators:

- $\frac{5}{6} > \frac{1}{2}$ because $\frac{3}{6} = \frac{1}{2}$ and $\frac{5}{6} > \frac{3}{6}$

Fractions with the same denominators may be compared using the numerators as a guide.

- $\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$

Fractions with the same numerators may be compared and ordered using the denominators as a guide.

- $\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$

4.NF.A.2 *continued*

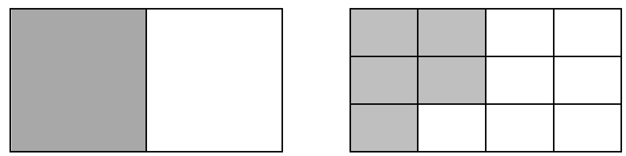
Example:

There are two cakes on the counter that are the same size. The first cake has $\frac{1}{2}$ of it left. The second cake has $\frac{5}{12}$ left. Which cake has more left?

Student 1

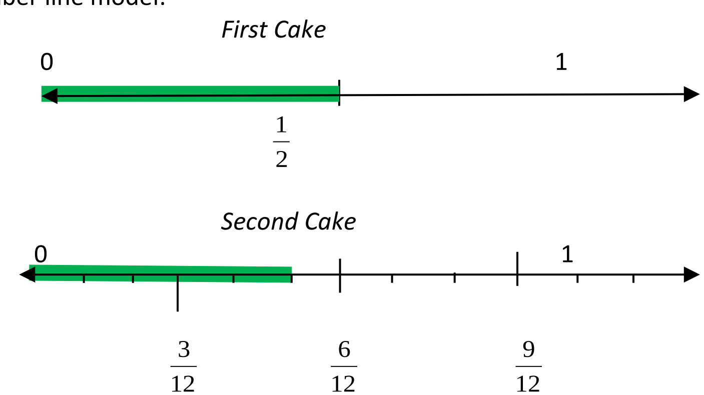
Area model:

The first cake has more left over. The second cake has $\frac{5}{12}$ left which is smaller than $\frac{1}{2}$.



Student 2

Number line model:



Student 3 verbal explanation:

I know that $\frac{6}{12}$ equals $\frac{1}{2}$. Therefore, the second cake which has $\frac{5}{12}$ left is less than $\frac{1}{2}$.

Number and Operations—Fractions (NF)

B. Build fractions from unit fractions by applying and extending previous understandings.

In this cluster, the terms students should learn to use with increasing precision are **operations, addition/joining, subtraction/separating, fraction, un it fraction, equivalent, multiple, reason, denominator, numerator, decomposing, mixed number, properties of operations, multiply,** and **multiple**.

Louisiana Standard	Explanations and Examples
4.NF.B.3 Understand a fraction $^a/_b$ with $a > 1$ as a sum of fractions $^1/_b$. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.) a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. *Example: 3/4 = 1/4 + 1/4 + 1/4.* *b.* Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples:* *$^3/_8={}^1/_8+{}^1/_8+{}^1/_8$;* *$^3/_8={}^1/_8+{}^2/_8$; $2\ {}^1/_8=1+1+{}^1/_8={}^8/_8+{}^8/_8+{}^1/_8$.*	**Component(s) of Rigor:** Conceptual Understanding (3, 3a, 3b), Procedural Skill and Fluency (3c), Application (3d) **Remediation - Previous Grade(s) Standard:** 1.OA.B.3, 1.OA.B.4, 1.OA.D.8, 2.OA.A.1, 3.NF.A.1, 3.NF.A.2 **4th Grade Standard Taught in Advance:** 4.NF.A.1 **4th Grade Standard Taught Concurrently:** 4.MD.A.2, 4.MD.B.4 A fraction with a numerator of one is called a unit fraction. When students investigate fractions other than unit fractions, such as $\frac{2}{3}$, they should be able to decompose the non-unit fraction into a combination of several unit fractions. **Examples**: • $\frac{2}{3}=\frac{1}{3}+\frac{1}{3}$ Being able to visualize this decomposition into unit fractions helps students when adding or subtracting fractions. Students need multiple opportunities to work with all forms of fractions, including mixed numbers, and be able to decompose them in more than one way. Students may use visual models to help develop this understanding. • $1\frac{1}{4}-\frac{3}{4}=\square$ and $1\frac{1}{4}=\frac{4}{4}+\frac{1}{4}$ $\frac{4}{4}+\frac{1}{4}=\frac{5}{4}$ $\frac{5}{4}-\frac{3}{4}=\frac{2}{4}=\frac{1}{2}$ • Mary and Lacey decide to share a pizza. Mary ate $\frac{3}{6}$ and Lacey ate $\frac{2}{6}$ of the pizza. How much of the pizza did the girls eat together? *Solution:* The amount of pizza Mary ate can be thought of as $\frac{3}{6}$ or $\frac{1}{6}$ and $\frac{1}{6}$ and $\frac{1}{6}$. The amount of pizza Lacey ate can be thought of as $\frac{1}{6}$ and $\frac{1}{6}$. The total amount of pizza they ate is $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$ or $\frac{5}{6}$ of the whole pizza. A separate algorithm for mixed numbers in addition and subtraction is not necessary. Students will tend to add or subtract the whole numbers first and then work with the fractions using the same strategies they have applied to problems that contained only fractions. **Teacher Note:** There is no mathematical reason to simplify fractions. Therefore, students are not required to do so.

4.NF.B.3 *continued*

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

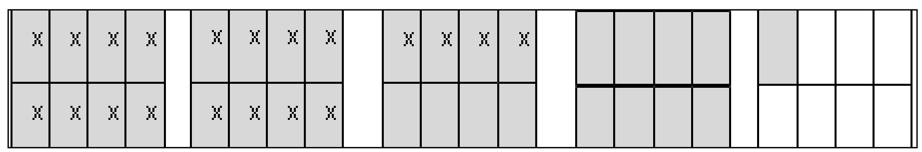
d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

- Susan and Maria need $8\frac{3}{8}$ feet of ribbon to package gift baskets. Susan has $3\frac{1}{8}$ feet of ribbon and Maria has $5\frac{3}{8}$ feet of ribbon. How much ribbon do they have altogether? Will the amount they have be enough to complete the project? Explain why or why not.

  The student thinks: I can add the ribbon Susan has to the ribbon Maria has to find out how much ribbon they have altogether. Susan has $3\frac{1}{8}$ feet of ribbon and Maria has $5\frac{3}{8}$ feet of ribbon. I can write this as $3\frac{1}{8} + 5\frac{3}{8}$. I know they have 8 feet of ribbon by adding the 3 and 5. They also have $\frac{1}{8}$ and $\frac{3}{8}$ which makes a total of $\frac{4}{8}$ more. Altogether they have $8\frac{4}{8}$ feet of ribbon. $8\frac{4}{8}$ is larger than $8\frac{3}{8}$ so they will have enough ribbon to complete the project. They will even have a little extra ribbon left, $\frac{1}{8}$ foot.

- Trevor has $4\frac{1}{8}$ pizzas left over from his soccer party. After giving some pizza to his friend, he has $2\frac{4}{8}$ of a pizza left. How much pizza did Trevor give to his friend?

  Solution: Trevor had $4\frac{1}{8}$ or $\frac{33}{8}$ pizzas to start. I shaded in rectangles to show how much he started with. I put an x in each shaded rectangle to show how much pizza he had left which was $2\frac{4}{8}$ or $\frac{20}{8}$ pizzas. The shaded rectangles without an x are the pieces of pizza he gave to his friend. There are 13 shaded rectangles without an x, so he gave his friend $\frac{13}{8}$ or $1\frac{5}{8}$ pizzas.



4.NF.B.4 Multiply a fraction by a whole number. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.)

a. Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent $5/4$ as the product $5\times(1/4)$, recording the conclusion by the equation $5/4 = 5\times(1/4)$.*

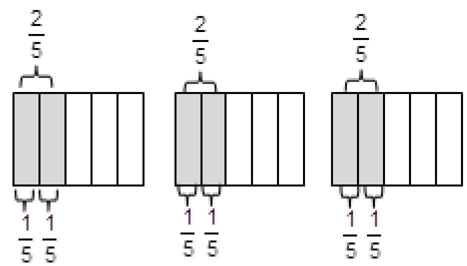
b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express $3\times(2/5)$ as $6\times(1/5)$, recognizing this product as $6/5$. (In general, $n\times(a/b)=(n\times a)/b$.*

Component(s) of Rigor: Conceptual Understanding (4a, 4b), Procedural Skill and Fluency (4, 4b), Application (4c)
Remediation - Previous Grade(s) Standard: none
4th Grade Standard Taught in Advance: none
4th Grade Standard Taught Concurrently: none

Students need many opportunities to work with problems in context to understand the connections between models and corresponding equations.

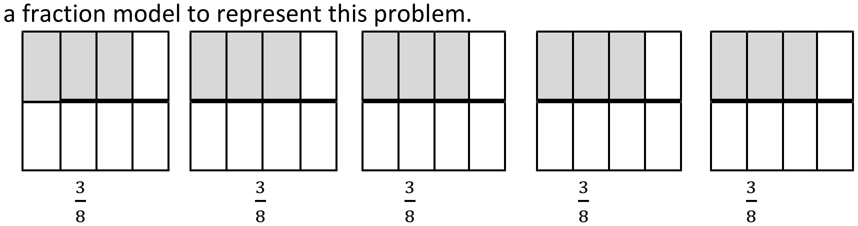
Examples:

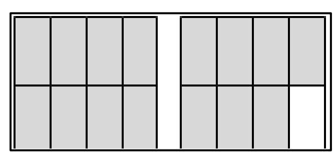
- $3 \times \frac{2}{5} = 6 \times \frac{1}{5} = \frac{6}{5}$



- If each person at a party eats $\frac{3}{8}$ of a pound of roast beef, and there are 5 people at the party, how many pounds of roast beef are needed? Between what two whole numbers does your answer lie?

  A student may build a fraction model to represent this problem.





$\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}=\frac{15}{8}=1\frac{7}{8}$ pounds of roast beef.

My answer is between 1 and 2.

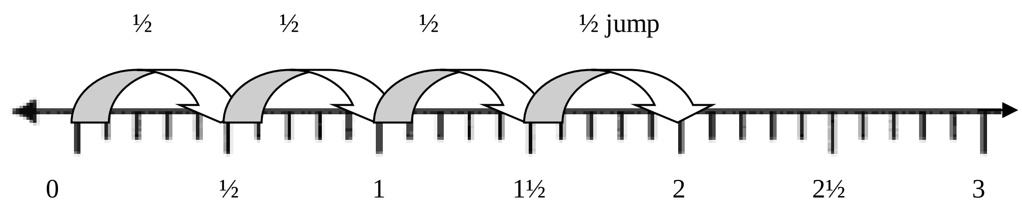
4.NF.B.4 *continued*

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

- In a relay race, each runner runs $\frac{1}{2}$ of a lap. If there are 4 team members, how long is the race?

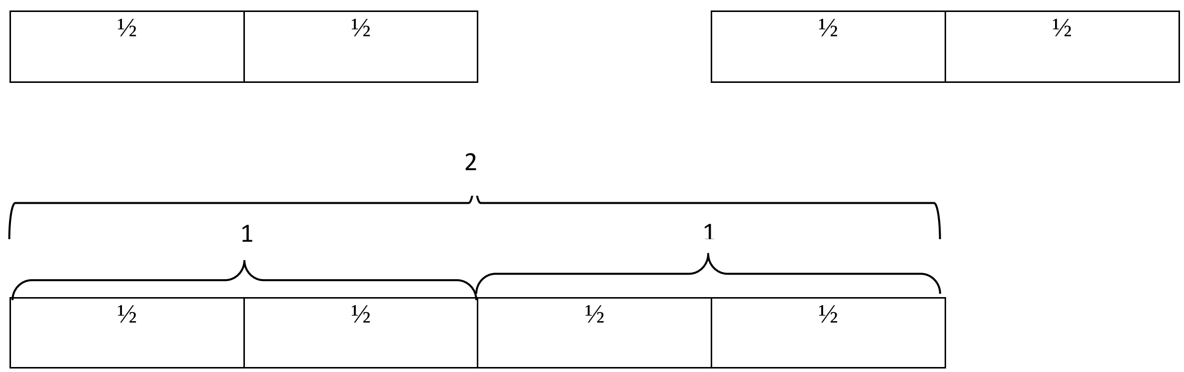
Student 1

Draws a number line and shows 4 jumps of $\frac{1}{2}$.



Student 2

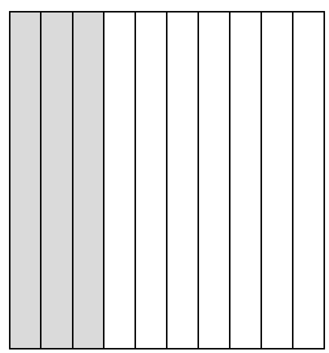
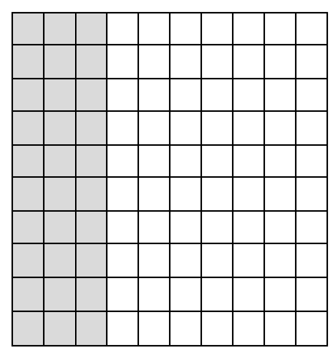
Draws an area model showing 4 pieces of $\frac{1}{2}$ joined together to equal 2.



Number and Operations—Fractions (NF)

C. Understand decimal notation for fractions, and compare decimal fractions.

In this cluster, the terms students should learn to use with increasing precision are **fraction, numerator, denominator, equivalent, reasoning, decimals, tenths, hundredths, multiplication, comparisons/compare, ‹, ›,** and =.

Louisiana Standard	Explanations and Examples
4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general, but addition and subtraction with unlike denominators in general is not a requirement at this grade.)	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** none **4th Grade Standard Taught in Advance:** 4.NF.A.1 **4th Grade Standard Taught Concurrently:** none This standard continues the work of equivalent fractions by having students change fractions with a 10 in the denominator into equivalent fractions that have a 100 in the denominator. In order to prepare for work with decimals (4.NF.C.6 and 4.NF.C.7), experiences that allow students to shade decimal grids (10 × 10 grids) can support this work. **Student experiences should focus on working with grids rather than algorithms.** Students can also use base-ten blocks and other place value models to explore the relationship between fractions with denominators of 10 and denominators of 100. Students may represent $\frac{3}{10}$ with 3 long blocks and may also write the fraction as $\frac{30}{100}$ with the whole being the flat (the flat represents one hundred units with each unit equal to one hundredth). **Tenths Grid**  3 tenths = $\frac{3}{10}$ **Hundredths Grid**  30 hundredths = $\frac{30}{100}$ This work in fourth grade lays the foundation for performing operations with decimal numbers in fifth grade.

4.NF.C.6 Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram; represent 62/100 of a dollar as $0.62.*

Component(s) of Rigor: Procedural Skill and Fluency
Remediation - Previous Grade(s) Standard: none
4th Grade Standard Taught in Advance: none
4th Grade Standard Taught Concurrently: none

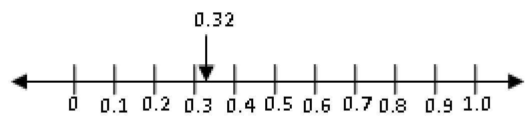
Decimals are introduced for the first time in fourth grade. Students should have ample opportunities to explore and reason about the idea that a number can be represented as both a fraction and a decimal.

Students make connections between fractions with denominators of 10 and 100 and the place value chart. By reading fraction names, students say $\frac{32}{100}$ as thirty-two hundredths and rewrite this as 0.32 or represent it on a place value model as shown below.

Hundreds	Tens	Ones	•	Tenths	Hundredths
			•	3	2

Students use the representations explored in 4.NF.C.5 to understand $\frac{32}{100}$ can be expanded to 3/10 and 2/100.

Students represent values such as 0.32 or $\frac{32}{100}$ on a number line. $\frac{32}{100}$ is more than $\frac{30}{100}$ (or $\frac{3}{10}$) and less than $\frac{40}{100}$ (or $\frac{4}{10}$). It is closer to $\frac{30}{100}$ so it would be placed on the number line near that value.

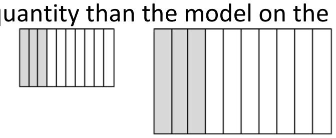


4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

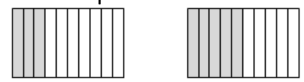
Component(s) of Rigor: Conceptual Understanding
Remediation - Previous Grade(s) Standard: none
4th Grade Standard Taught in Advance: 4.NF.A.2, 4.NF.C.6
4th Grade Standard Taught Concurrently: none

Students build area and other models to compare decimals. Through these experiences and their work with fraction models, they build the understanding that comparisons between decimals or fractions are only valid when the whole is the same for both cases.

- Each of the models below shows 3/10 but the whole on the right is much bigger than the whole on the left. They are both 3/10 but the model on the right is a much larger quantity than the model on the left.



Decimals or fractions can be compared only when the wholes are the same.

4.NF.C.7 *continued*	**Examples**: • Draw a model to show that 0.3 < 0.5. (Students would sketch two models of approximately the same size to show the area that represents three-tenths is smaller than the area that represents five-tenths.  • Fill in the blank with < , = , or > to make the correct comparison. o 4 tenths + 3 hundredths _____ 2 tenths + 12 hundredths o 3 hundredths + 4 tenths _____ 2 tenths + 22 hundredths o 5 hundredths + 1 tenth _____ 11 tenths + 4 hundredths o 5 hundredths + 1 tenth _____ 15 hundredths + 0 tenths o 5 hundredths + 1 tenth _____ 0 tenths + 15 hundredths • Fill in the blank with < , = , or > to complete the equation. o 0.01 _____ 0.11 o 0.2 _____ 0.20 o 0.6 _____ 0.41 o 0.07 _____ 0.70 o 0.57 _____ 0.75

Measurement and Data (MD)

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

In this cluster, the terms students should learn to use with increasing precision are **measure, metric, customary, convert/conversion, relative size, liquid volume, mass, length, distance, kilometer (km), meter (m), centimeter (cm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in), foot (ft), ounce (oz), pound (lb), time, hour, minute, second, equivalent, operations, add, subtract, multiply, divide, fractions, decimals, area,** and **perimeter**.

Louisiana Standard	Explanations and Examples
4.MD.A.1 Know relative sizes of measurement units within one system of units including: ft, in; km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. (Conversions are limited to one-step conversions.) Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs* (*1, 12*), (*2, 24*), (*3, 36*),*…*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.OA.C.7, 3.MD.A.2 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** 4.OA.A.2 The units of measure that have not been addressed in prior years are pounds, ounces, kilometers, milliliters, and seconds. Students' prior experiences were limited to measuring length, mass, liquid volume, and elapsed time. Students did not convert measurements. Students need ample opportunities to become familiar with these new units of measure. Relating units within the metric system is another opportunity to think about place value. Relating units within the traditional system provides an opportunity to engage in mathematical practices, especially "look for and make use of structure" and "look for and express regularity in repeated reasoning." For example, students may use a two-column chart such as the one below to convert from larger to smaller units and record equivalent measurements. They make statements such as, if one foot is 12 inches, then 3 feet has to be 36 inches because there are 3 groups of 12. **Example**: Foundational understandings to help with measure concepts include the following: • Understand that larger units can be subdivided into equivalent units (partition). • Understand that the same unit can be repeated to determine the measure (iteration). • Understand the relationship between the size of a unit and the number of units needed (the larger the unit, the fewer units needed to determine the measure of an object).

kg	g
1	1000
2	2000
3	3000

ft	in
1	12
2	24
3	36

lb	oz
1	16
2	32
3	48

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving whole numbers and/or simple fractions (addition and subtraction of fractions with like denominators and multiplying a fraction times a fraction* or a whole number), and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

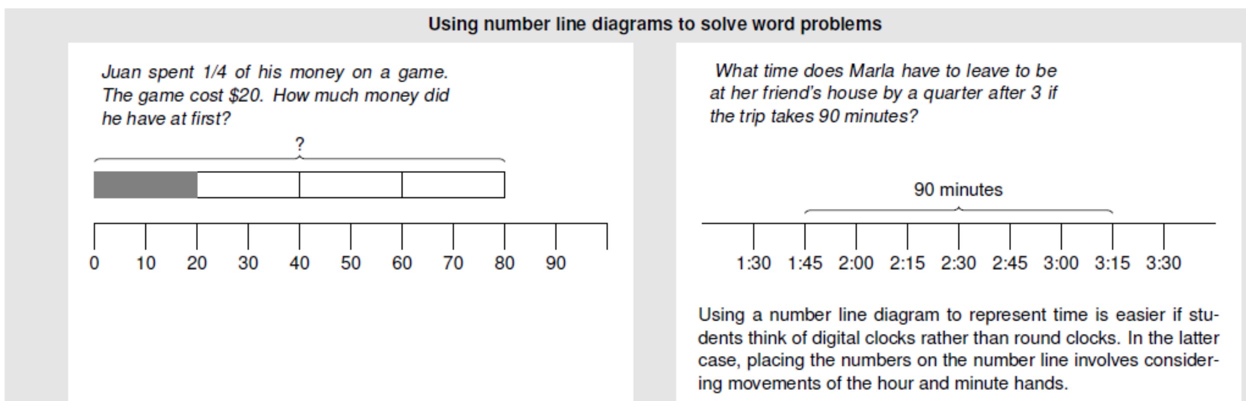
* Students in Grade 4 will be assessed on multiplying a fraction and a whole number as indicated in the NF domain. Some students may be able to multiply a fraction by a fraction as a result of generating equivalent fractions; however, mastery of multiplying two fractions occurs in Grade 5.

Component(s) of Rigor: Conceptual Understanding, Application
Remediation - Previous Grade(s) Standard: none
4th Grade Standard Taught in Advance: 4.NF.C.5, 4.NF.C.6, 4.MD.A.1,
4th Grade Standard Taught Concurrently: 4.OA.A.3

This standard includes multi-step word problems related to expressing measurements from a larger unit in terms of a smaller unit (e.g., feet to inches, meters to centimeter, and dollars to cents). Students should have ample opportunities to use number line diagrams to solve word problems. Number line diagrams that feature a measurement scale can represent measurement quantities. Examples include a ruler, a diagram marking off distance along a road with cities at various points, a timetable showing hours throughout the day, or a volume measure on the side of a container.

Examples:

- **Addition:** Mason ran for 1 hour and 15 minutes on Monday, 25 minutes on Tuesday, and 40 minutes on Wednesday. What was the total number of minutes Mason ran?
- **Multiplication:** Mario and his 2 brothers are selling lemonade. Mario brings one and a half liters, Javier brings 2 liters, and Ernesto brings 450 milliliters. How many total milliliters of lemonade do the boys have?
- **Multiple Operations:** Mr. Miller told the people in his office that he would buy a hamburger or a salad for their lunch. The restaurant told Mr. Miller that hamburgers cost $6 each and a salad was twice as much. Both costs included tax. Hamburgers were requested by 13 people and 7 people wanted salads. Mr. Miller gave the cashier three $50 bills and a $20 bill. How much change should Mr. Miller receive?

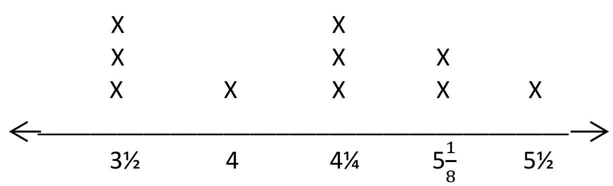


4.MD.A.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*	**Component(s) of Rigor:** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 3.OA.A.4, 3.MD.D.8 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none Students developed understanding of area and perimeter in third grade by using visual models. **While students are expected to use formulas to calculate area and perimeter of rectangles, they need to understand and be able to communicate their understanding of why the formulas work.** The use of abstract formulas by students underscores the importance of distinguishing between area and perimeter in grade 3 and maintaining the distinction in grade 4 and later grades, where rectangle perimeter and area problems may get more complex and problem-solving can benefit from knowing or being able to rapidly remind oneself of how to find an area or perimeter. By repeatedly reasoning about how to calculate areas and perimeters of rectangles, students can come to see area and perimeter formulas as summaries of all such calculations. **"Apply the formula" does not mean write down a memorized formula and put in known values because students do not evaluate expressions until grade 6.** In fourth grade, working with perimeter and area of rectangles is still grounded in specific visualizations and numbers. By repeatedly reasoning about constructing situation equations for perimeter and area involving specific numbers and an unknown number, students will build a foundation for applying area, perimeter, and other formulas by substituting specific values for the variables in later grades. Students should generate and discuss advantages and disadvantages of the various formulas for finding perimeter of a rectangle and make connections between them (i.e., $l + w + l + w$ or $2l + 2w$ or $2(l + w)$ including the fact that perimeter is measured in linear units). For area, students need to connect counting squares in a rectangle to the formula $A = l \times w$. The numbers used can be any of the numbers allowed in fourth grade (for addition and subtraction for perimeter and for multiplication and division for area). Students should apply these understandings and formulas to the solution of real-world and mathematical problems. **Example:** A rectangular garden has as an area of 80 square feet. It is 5 feet wide. How long is the garden? Here, specifying the area and the width creates an unknown factor problem. Similarly, students could solve perimeter problems that give the perimeter and the length of one side and ask the length of the adjacent side. Students should be challenged to solve multi-step problems. **Example:** Karl's Garden: https://www.illustrativemathematics.org/content-standards/4/MD/A/3/tasks/876

Measurement and Data (MD)

B. Represent and interpret data.

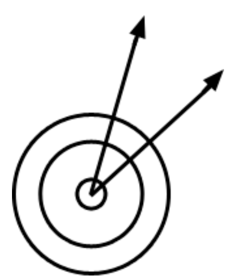
In this cluster, the terms students should learn to use with increasing precision are **data, line plot, length,** and **fractions**.

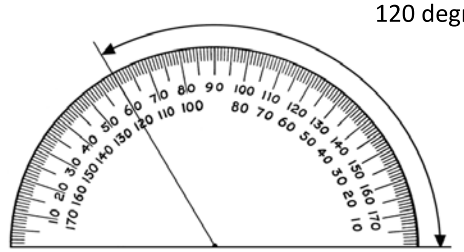
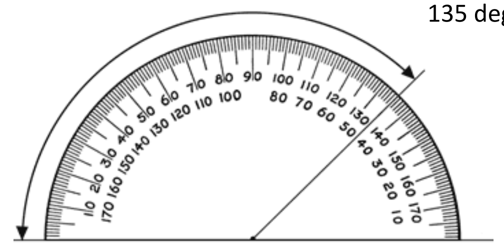
Louisiana Standard	Explanations and Examples
4.MD.B.4 Make a line plot to display a data set of measurements in fractions of a unit ($^1/_2$, $^1/_4$, $^1/_8$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*	**Component(s) of Rigor:** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 3.MD.B.4 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none This standard provides a context for students to work with fractions by measuring objects to an eighth of an inch. Students make a line plot of this data and then add and subtract fractions based on data in the line plot. **Example**: • Ten students in Room 31 measured their pencils, in inches, at the end of the day. They recorded their results on the line plot below.  The following are possible questions: o What is the difference in length from the longest to the shortest pencil? o If the pencils have are $5\frac{1}{8}$ inches long are placed end to end, what would their total length be?

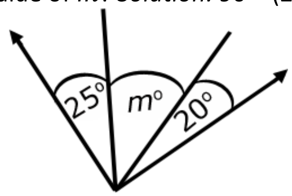
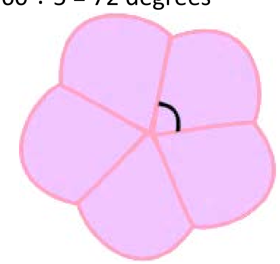
Measurement and Data (MD)

C. Geometric measurement: understand concepts of angle and measure angles.

In this cluster, the terms students should learn to use with increasing precision are **measure, point, end point, geometric shapes, ray, angle, circle, fraction, intersect, one-degree angle, protractor, decomposed, addition, subtraction, unknown, obtuse,** and **acute**.

Louisiana Standard	Explanations and Examples
4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where two rays intersect the circle. b. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. c. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** none **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** 4.G.A.1, 4.G.A.2 This standard brings up a connection between angles and circular measurement (360 degrees). Angle measure is a "turning point" in the study of geometry. Students often find angles and angle measure to be difficult concepts to learn, but that learning allows them to engage in interesting and important mathematics. An *angle* is the union of two rays, *a* and *b*, with the same initial point *P*. The rays can be made to coincide by rotating one to the other about *P*; this rotation determines the size of the angle between ray *a* and ray *b*. The rays are sometimes called the *sides* of the angles. Another way of saying this is that each ray shows a direction and the angle size measures the change from one direction to the other. Angles are measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and degrees are the unit used to measure angles in elementary school. A full rotation is thus 360°. An *obtuse angle* is an angle with measures greater than 90° and less than 180°. An *acute angle* is an angle with measure less than 90°. The diagram below will help students understand that an angle measurement is not related to an area since the area between the 2 rays is different for both circles yet the angle measure is the same. 

4.MD.C.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	**Component(s) of Rigor:** Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** none **4th Grade Standard Taught in Advance:** 4.MD.C.5 **4th Grade Standard Taught Concurrently:** none Before students begin measuring angles with protractors, they need to have some experiences with benchmark angles. They transfer their understanding that a 360° rotation about a point makes a complete circle to recognize and sketch angles that measure approximately 90º and 180°. They extend this understanding and recognize and sketch angles that measure approximately 45° and 30°. They use appropriate terminology (acute, right, and obtuse) to describe angles and rays (perpendicular). Students should measure angles and sketch angles using a protractor. 120 degrees  135 degrees  As with all measureable attributes, students must first recognize the attribute of angle measure, and distinguish it from other attributes. As with other concepts students need varied examples and explicit discussions to avoid learning limited ideas about measuring angles (e.g., misconceptions that a right angle is an angle that points to the right, or two right angles represented with different orientations are not equal in measure). If examples and tasks are not varied, students can develop incomplete and inaccurate notions. For example, some come to associate all slanted lines with 45° measures and horizontal and vertical lines with measures of 90°. Others believe angles can be "read off" a protractor in "standard" position, that is, a base is horizontal, even if neither ray of the angle is horizontal. Measuring and then sketching many angles with no horizontal or vertical ray can help students avoid such limited conceptions.

4.MD.C.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a letter for the unknown angle measure.	**Component(s) of Rigor: Conceptual Understanding,** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 1.OA.D.8 **4th Grade Standard Taught in Advance:** 4.MD.C.5 **4th Grade Standard Taught Concurrently:** none This standard addresses the idea of decomposing (breaking apart) an angle into smaller parts and understanding that angle measures can be added and subtracted. **Examples**: • If the two rays are perpendicular, what is the value of m? *Solution:* 90 – (25 + 20) = 45 degrees  • Joey knows that when a clock's hands are exactly on 12 and 1, the angle formed by the clock's hands measures 30°. What is the measure of the angle formed when a clock's hands are exactly on the 12 and 4? • The five shapes in the diagram are the exact same size. Write an equation that will help you find the measure of the indicated angle. Find the angle measurement. *Solution:* 360 ÷ 5 = 72 degrees 

Measurement and Data (MD)

D. Related area to operations of multiplication and addition.

In this cluster, the terms students should learn to use with increasing precision are **decomposing, non-overlapping,** and **adding area**.

Louisiana Standard	Explanations and Examples
4.MD.D.8 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.	**Component(s) of Rigor: Conceptual Understanding,** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 3.MD.C.7 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none This standard uses the word rectilinear. A rectilinear figure is a polygon that has all right angles. This standard serves as the basis for understanding volume as additive in fifth grade and also connects to angle addition in 4.MD.C.7. **Example:** How could this figure be decomposed to help find the area? **Three solutions are provided below.** I drew a line and made two rectangles. One rectangle is 12 x 8 which is 96. I subtracted 8 feet from the top length to find the missing length for the second rectangle. 16-8 = 8. 8 x 6 = 48. I added 48 to 96 and got 144. Area has to be in square units, so the answer is 144 square feet.

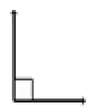
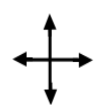
4.MD.D.8 *continued*	I drew a line and made two rectangles. The top rectangle is 16 x 6 which is 96. I subtracted 6 feet from the side that is 12 feet to find the missing side of the bottom rectangle. 12 – 6 = 6. 8 x 6 = 48. I added 48 to 96 and got 144. Area has to be in square units, so the answer is 144 square feet. I thought this was a 16 x 12 rectangle with a smaller rectangle cut out. 16 x 12 = 192. Then I had to find the missing sides of the small rectangle that I drew with dotted lines. I can see that the sides are half as long as the big rectangle which gives me 8 and 6 and 8 x 6 = 48. Cutting out is like subtracting, so 192 – 48 = 144. The area of the black part is 144 square feet.

Geometry (G)

A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles

In this cluster, the terms students should learn to use with increasing precision are **classify shapes/figures, properties, point, line, line segment, ray, angle, vertex/vertices, right angle, acute, obtuse, perpendicular, parallel, right triangle, isosceles triangle, equilateral triangle, scalene triangle, line of symmetry, symmetric figures, two dimensional, regular,** and **irregular**.

Louisiana Standard	Explanations and Examples
4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 3.G.A.1 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** 4.MD.C.5 This standard asks students to draw specific geometric figures and to also identify them in two-dimensional figures. This is the first time that students are exposed to rays, angles, and perpendicular and parallel lines. Examples of points, line segments, lines, angles, parallelism, and perpendicularity can be seen daily. Students may not easily identify lines and rays because they are more abstract.

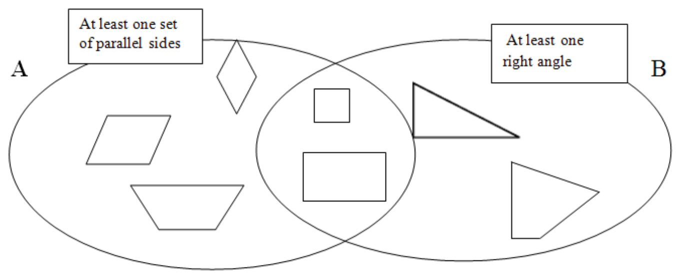
right angle		line	
acute angle		ray	
obtuse angle		parallel lines	
straight angle		perpendicular lines	
segment			

4.G.A.1 *continued*	**Examples:** • Draw two different types of quadrilaterals that have two pairs of parallel sides? • Is it possible to have an acute right triangle? Justify your reasoning using pictures and words. • How many acute, obtuse, and right angles are in this shape? 
4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	**Component(s) of Rigor:** Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** none **4th Grade Standard Taught in Advance:** 4.G.A.1 **4th Grade Standard Taught Concurrently:** 4.MD.C.5 Two-dimensional figures may be classified using different characteristics, such as parallel or perpendicular lines or by angle measurement. It also calls for students to sort objects based on parallelism, perpendicularity, and angle types. **Parallel or Perpendicular Lines:** Students should become familiar with the concept of parallel and perpendicular lines. Two lines are parallel if they never intersect and are always equidistant. Two lines are perpendicular if they intersect in right angles (90°). Students may use transparencies with lines to arrange two lines in different ways to determine that the 2 lines might intersect in one point or may never intersect. These types of explorations may lead to a discussion on angles. A **kite** is a quadrilateral whose four sides can be grouped into two pairs of equal-length sides that are beside (adjacent to) each other. A **trapezoid** is a quadrilateral with at least one pair of parallel sides. (There are two definitions commonly used in different curricula in the U.S. This is the definition that Louisiana has chosen to use.) With this definition, parallelograms are also trapezoids.

4.G.A.2 *continued*

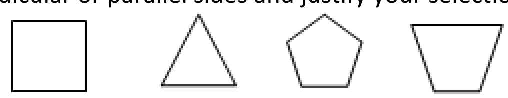
Example:

- Do you agree with the label on each of the circles in the Venn diagram below? Explain why some shapes fall in the overlapping sections of the circles.



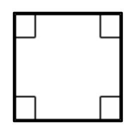
Example:

- Identify which of these shapes have perpendicular or parallel sides and justify your selection.



The following is a possible justification that students might give:

The square has perpendicular sides because the sides meet at a corner, forming right angles. It also has parallel sides that are opposite from each other. I know this because if I changed the sides to lines that never end, the lines would never intersect and be the same distance apart. Segments are just parts of lines.



Angle Measurement:

This expectation is closely connected to 4.MD.C.5, 4.MD.C.6, and 4.G.A.1. Students' experiences with drawing and identifying right, acute, and obtuse angles support them in classifying two-dimensional figures based on specified angle measurements. They use the benchmark angles of 90°, 180°, and 360° to approximate the measurement of angles.

Right triangles can be a category for classification. A right triangle has one right angle. There are different types of right triangles. An isosceles right triangle has two sides that are the same length and a scalene right triangle does not have any sides that are the same length.

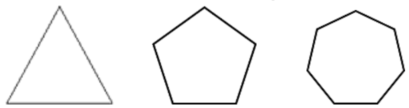
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** 1.G.A.2 **4th Grade Standard Taught in Advance:** none **4th Grade Standard Taught Concurrently:** none Students need experiences with figures which are symmetrical and non-symmetrical. Figures include both regular and non-regular polygons. Folding cut-out figures will help students determine whether a figure has one or more lines of symmetry. The standard does not address rotational symmetry. **Example**: For each figure, draw all of the lines of symmetry. What pattern do you notice? How many lines of symmetry do you think there would be for regular polygons with 9 and 11 sides. Sketch each figure and check your predictions. 

Table 2. Common multiplication and division situations.[1]

	Unknown Product	Group Size Unknown ("How many in each group?" Division)	Number of Groups Unknown ("How many groups?" Division)
	3 x 6 = ?	**3 x ? = 18, and 18 ÷ 3 = ?**	**? x 6 = 18, and 18 ÷ 6 = ?**
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays,[2] Area[3]	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example*. What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example*. A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example*. A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
Compare	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	$a \times b = ?$	$a \times ? = p$, and $p \div a = ?$	$? \times b = p$, and $p \div b = ?$

[1]The first examples in each cell are examples of discrete things. These are easier for students and should be given before the measurement examples.
[2]The language in the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: The apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.
[3]Area involves arrays of squares that have been pushed together so that there are no gaps or overlaps, so array problems include these especially important measurement situations.

Grade 1 Standards

1.OA.B.3 Apply properties of operations to add and subtract. *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)* *Return to* 4.NF.B.3

1.OA.B.4 Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.* *Return to* 4.NF.B.3

1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ? – 3, 6 + 6 = ?.* *Return to* 4.NF.B.3, 4.MD.C.7

1.G.A.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) and three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. *Return to* 4.G.A.3

Grade 2 Standards

2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. *Return to* 4.NF.B.3

2.NBT.A.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

a. 100 can be thought of as a bundle of ten tens — called a "hundred."
b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

Return to 4.NBT.A.1

Grade 3 Standards

3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* *Return to* 4.OA.A.1

3.OA.A.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. *Return to* 4.OA.A.1, 4.OA.A.2

3.OA.A.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 = ?* *Return to* 4.MD.A.3

3.OA.B.5 Apply properties of operations as strategies to multiply and divide.[2] *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.)* *Return to* 4.NBT.B.5, 4.NBT.B.6

3.OA.C.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.
Return to 4.OA.B.4, 4.NBT.B.5, 4.NBT.B.6, 4.MD.A.1

3.OA.D.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. *Return to* 4.OA.A.3

3.OA.D.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. *Return to* 4.OA.C.5

3.NBT.A.1 Use place value understanding to round whole numbers to the nearest 10 or 100. *Return to* 4.NBT.A.3

3.NBT.A.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. *Return to* 4.NBT.B.4, 4.NBT.B.5, 4.NBT.B.6

3.NBT.A.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. *Return to* 4.NBT.B.5

3.NF.A.1 Understand a fraction 1/b, with denominators 2, 3, 4, 6, and 8, 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. *Return to* 4.NF.B.3

3.NF.A.2 Understand a fraction with denominators 2, 3, 4, 6, and 8 as a number on a number line diagram.

a. Represent a fraction $1/b$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size $1/b$ and that the endpoint of the part based at 0 locates the number $1/b$ on the number line. *Return to* 4.NF.B.3

3.NF.A.3 Explain equivalence of fractions with denominators 2, 3, 4, 6, and 8 in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
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.
c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.
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.

Return to 4.NF.A.1

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). 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. *Return to* 4.MD.A.1

3.MD.B.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. *Return to* 4.MD.B.4

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

a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
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.
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 + b and a + c. Use area models to represent the distributive property in mathematical reasoning.

Return to 4.MD.D.8

3.MD.D.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. *Return to* 4.MD.A.3

3.G.A.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. *Return to* 4.G.A.1