Standards Resource Guide

Grade 5

Overview

This guide is designed to support educators in interpreting and implementing the 2025 Louisiana Student Standards for Mathematics (LSSM). It provides descriptions of each standard to clarify its meaning and application to student learning. The document outlines the intended level of rigor and includes coherence to prerequisite and corequisite standards. Examples are provided for illustrative purposes only and do not represent a comprehensive list.

Additional information on the 2025 Louisiana Student Standards for Mathematics, including guidance on reading standards codes, a listing of standards for each grade or course, and links to additional resources, is available on the Louisiana Math Page. Questions may be directed to math@la.gov.

August 2026

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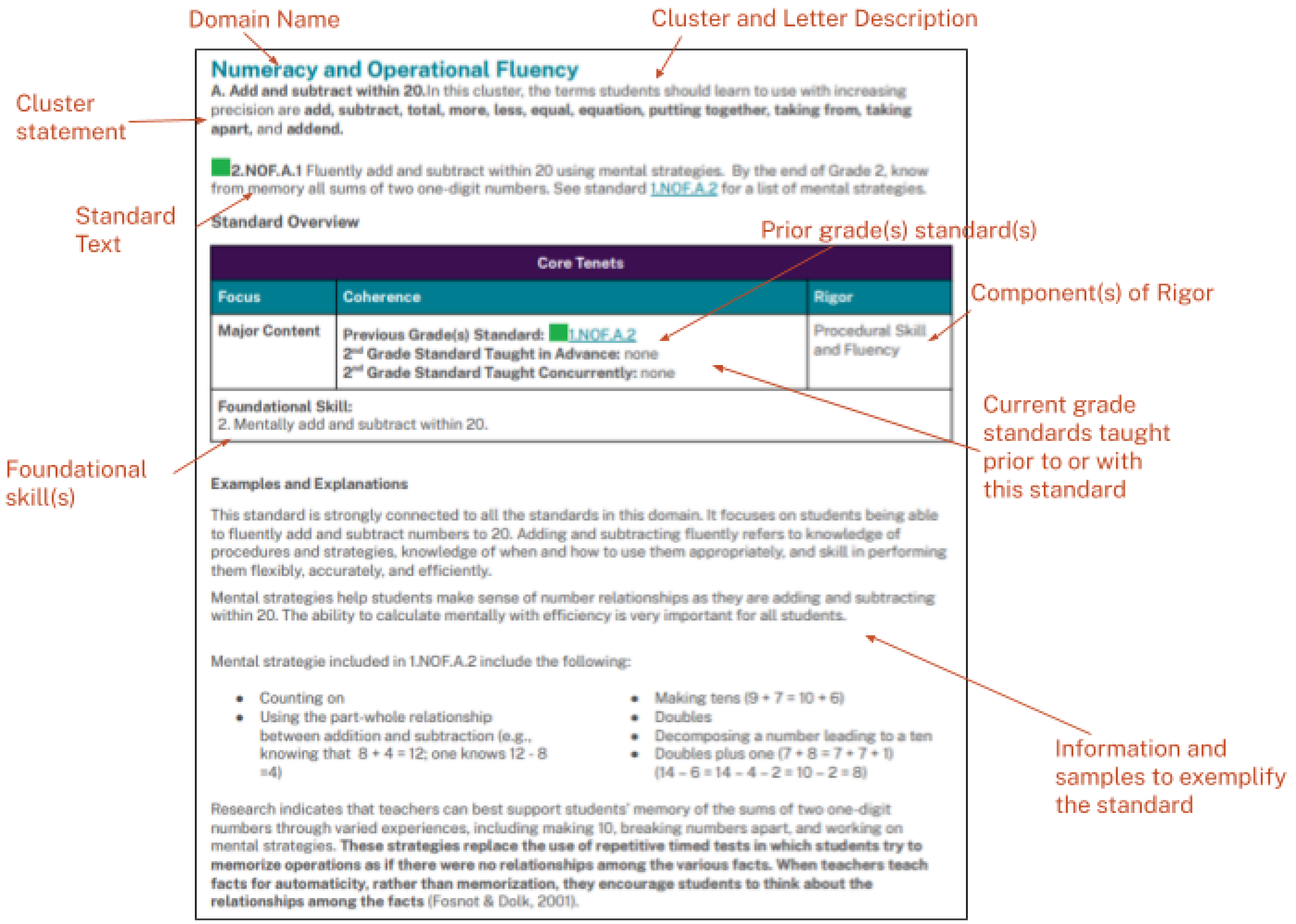
Introduction

How to Read This Guide

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



*Grades 3 through Geometry will also include a section with connections to assessment item types and achievement level descriptors.

Standards Codes: ■ Major Work, □ Supporting Work, ○ Additional Work

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, which 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 new learning related to the current grade-level standard. For students who have unfinished learning, teachers should build in proactive, just-in-time supports to build essential prerequisite knowledge.
4. **Standards Taught in Advance:** These grade-level standards demonstrate within-grade coherence and include concepts on which the target standard is built. Students should have exposure to these standards before instruction in the target standard. As with previous-grade standards, teachers should plan proactive, just-in-time supports to build within-grade prerequisite knowledge ahead of instruction on the target standard.
5. **Standards Taught Concurrently:** These grade-level standards demonstrate within-grade coherence and include standards that should be taught at the same time as the target standard to provide coherence and connectedness in instruction.
6. **Component(s) of Rigor:** See full explanation on components of rigor below.
7. **Sample Problem:** The sample problem provides an example of 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

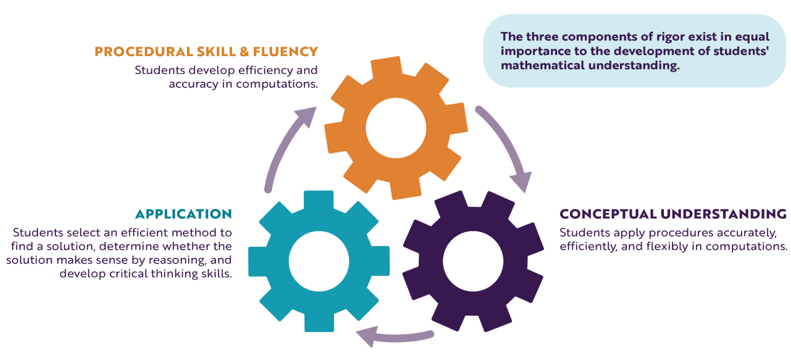
Students should spend the majority of time on the major work of the grade, supporting work and, where appropriate, additional work engages students in the major work of the grade, often through a change of the **context** within which students are performing mathematics. Each standard is color-coded to quickly and simply determine the focus for the grade. 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 respective grades.

Core Tenets

The 2016 Louisiana Student Standards for Math called for three instructional shifts. Since then, teachers have used these shifts to ensure deep understanding and consistent application in mathematics classrooms across the state. Now, these shifts are recognized as core tenets that serve as the foundation and guiding principles of Louisiana's mathematics standards.

Coherence in mathematics refers to a coherent body of knowledge composed of interconnected concepts, principles, and procedures. These concepts are logically linked, building upon one another, and work together to deepen understanding, support problem solving, and enable learners to apply mathematical ideas consistently and meaningfully across different contexts.

Rigor in mathematics instruction does not simply mean increasing the difficulty or complexity of practice problems. Incorporating rigor into classroom instruction and student learning requires students to engage deeply with standards and grapple meaningfully with the concepts and ideas embedded within them.



At a greater depth the standards and ideas with which students are grappling. The **three** components of rigor, listed below, exist in equal importance to the development of students' mathematical understanding.

- **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 without dictating the strategy or method chosen. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.
- **Application** provides valuable context for learning and the opportunity to solve problems in a relevant and 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.

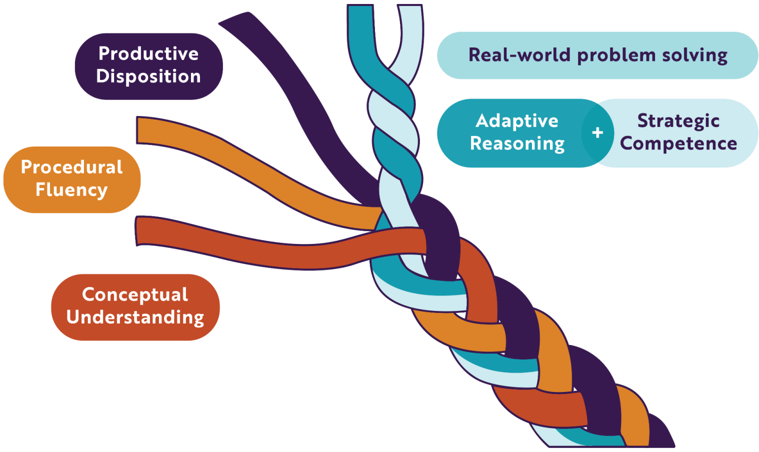
Focus calls for intentional emphasis on specific topics, skills and ideas within grade level mathematics instruction. Not all content in a given grade is emphasized equally in the standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or the importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Louisiana Standards for Mathematical Practice. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Students should spend the large majority of 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.

The Strands for Mathematical Proficiency

The strands of mathematical proficiency, as defined by the National Research Council (NRC),[1] provide a framework describing what proficiency means for a learner in mathematics.

The strands of mathematical proficiency are intertwined, gradually developed, and deepened over time. When intentionally presented in a connected and balanced way, each strand supports the others, ultimately strengthening the proficiency of learners.

1. **Conceptual Understanding** - Students develop an understanding of key mathematical ideas and relationships and explain why procedures work.



2. **Procedural Fluency** - Students use mathematical procedures with skill and flexibility, guided by a strong grasp of underlying concepts.
3. **Productive Dispositions** - Students view mathematics as coherent, valuable, and meaningful
4. **Real World and Problem Solving** - A combination of both adaptive reasoning and strategic competence, students represent and solve real-world mathematical problems logically, justify solutions, and clearly explain and defend reasoning.

The Relationship Between Mathematical Proficiency and the Components of Rigor

While there is some overlap between the Strands of Mathematical proficiency and the Core Tenets, there is a distinct difference between the two. The strands are a framework that is focused on learner outcomes and what it means for a student to be proficient in mathematics. The Core Tenets provide a framework for how teachers should design instruction to support learning. The core tenets reflect what should be done instructionally, while the proficiency strands represent the outcome, or what students become, as a result of that instruction.

Mathematical Fluency

Fluency in mathematics is the ability to apply foundational skills and concepts flexibly, accurately, and efficiently, grounded in strong conceptual understanding to solve problems, make connections, and reason mathematically across various contexts. While fluency is an essential component of mathematics instruction, it does not represent the full depth of a mathematical standard; it must be developed alongside conceptual understanding, reasoning, and problem-solving to ensure deep and meaningful learning.

Concrete - Representational - Abstract Framework

The Concrete-Representational-Abstract (CRA) Framework describes the instructional processes that students experience to build conceptual understanding of mathematics. The first stage is where students build a concrete understanding of a concept through the use of manipulatives or other physical objects. During the second phase, learners move into visual representations of concepts. Finally, during the

[1] ADDING + IT UP HELPING CHILDREN LEARN MATHEMATICS National Academies of Sciences, Engineering, and Medicine. 2001. Adding It Up: Helping Children Learn Mathematics. Washington, DC: The National Academies Press. https://doi.org/10.17226/5109.

abstract phase, students apply their understanding of the concepts abstractly through the use of numbers and symbols. When students engage in learning that follows this process, it allows them to build a solid understanding of key mathematical concepts and ideas, ensuring comprehension that is transferable and flexibly applied across grade bands.

An example of how this framework is represented across the progression of the Louisiana Student Standards for Mathematics can be seen in the way student learning progresses across a concept, such as linear functions. In fourth grade (4.AR.A.1), students are introduced to multiplicative comparison, where much of the learning is very **concrete**. At this phase, students are using counters and other manipulatives to physically compare quantities to determine the meaning of "times as many." When they move into the middle grades, this becomes more representational as students apply their concrete understanding to recognize and represent proportional relationships. These are represented in various ways, such as ratio tables, double number lines, and graphs (6.PF.A.2, 7.PF.A.2). When students enter high school, the learning becomes **abstract** as they interpret linear functions such as y=kx and come to understand slope as rate of change.

While the example above represents a linear version of this instructional process across multiple grades, it is important to note that the concrete and representational components can occur at different times throughout the progression of learning, and may occur simultaneously across various periods. Additionally, this instructional process may also occur within lessons, units, or within the grade level.

Note about tasks vs. word problems: Real-world math tasks are open-ended and involve reasoning, exploration, and multiple solution paths. Word problems, by contrast, are usually structured scenarios with all needed information and a single correct answer. Real-world tasks build critical thinking and decision-making, while word problems focus on translating language into mathematical operations. Both types of tasks play an important role in mathematics learning — neither is inherently better than the other. Students should have frequent opportunities to engage with both, as each develops different but complementary aspects of mathematical proficiency.

Word Problem (5.AR.D.6)	**Real-World Mathematical Task** (5.AR.D.6)
A librarian has 48 books to pack into boxes. Each box must have the same number of books. The librarian wants to use the fewest number of boxes possible, but each box must contain more than 10 books. How many boxes should the librarian use and how many books will be in each box? Explain how you arrived at your answer.	A librarian has 48 books to pack into boxes. Each box must have the same number of books. Identify at least 4 different ways the books can be packed. For each arrangement, tell how many boxes are used and how many books are in each box. Which arrangement do you think the librarian should select? Explain why.

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 5 complete.

Louisiana Standards for Mathematical Practice (MP)	
Louisiana Standard	**Explanations and Examples**
5.MP.1 Make sense of problems and persevere in solving them.	Students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".
5.MP.2 Reason abstractly and quantitatively.	Fifth graders should recognize that a number represents a specific quantity. They connect quantities 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 that record calculations with numbers and represent or round numbers using place value concepts.
5.MP.3 Construct viable arguments and critique the reasoning of others.	In fifth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. 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.
5.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. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.
5.MP.5 Use appropriate tools strategically.	Fifth 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 unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real-world data.
5.MP.6 Attend to precision.	Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of

	measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.
5.MP.7 Look for and make use of structure.	In fifth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.
5.MP.8 Look for and express regularity in repeated reasoning.	Fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Grade Level Expected Foundational Skills

By the end of grade 5, mathematically proficient students can reliably apply the following skills to engage in grade-appropriate mathematical tasks. This list does not represent the full depth of learning expected in grade 5, but consists of the foundational skills required by the standards.

1. Evaluate and compare simple expressions.
2. Fluently multiply multi-digit whole numbers using a standard algorithm.
3. Multiply a fraction by a whole number or a fraction.
4. Read and write decimals to the thousandths.
5. Compare and order whole numbers and decimals, identifying greater than, less than, or equal to.
6. Estimate and round multi-digit numbers with decimals to any place.
7. Add and subtract fractions with unlike denominators.

Numeracy and Operational Fluency

A. Use equivalent fractions as a strategy to add and subtract fractions. In this cluster, the terms students should learn to use with increasing precision are **fraction, equivalent, sum, difference, unlike denominator, numerator, benchmark fraction, estimate, reasonableness,** and **mixed number.**

5.NOF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers and fractions greater than 1) by replacing given fractions with equivalent fractions to produce an equivalent equation with fractions that have like denominators.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.C.7, 4.NOF.D.9 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 8. Add and subtract fractions with unlike denominators.		

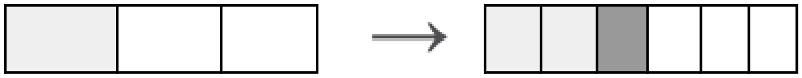
Examples and Explanations

Students should apply their understanding of equivalent fractions developed in fourth grade and their ability to rewrite fractions in an equivalent form to find common denominators. This process should come after students have used visual fraction models (area models, number lines, etc.) to build understanding. The use of visual fraction models allows students to reason about a common denominator prior to using the algorithm. For example, when adding $\frac{1}{3}+\frac{1}{6}$ Grade 5 students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators. While simplifying fractional answers is not required, simplifying should be allowed.

Example:

- $\frac{1}{3}+\frac{1}{6}$

$\frac{1}{3}$ is the same as $\frac{2}{6}$. I drew a rectangle and shaded $\frac{1}{3}$. I knew that if I cut every third in half then I would have sixths. Based on my picture, $\frac{1}{3}$ equals $\frac{2}{6}$. Then I shaded in another $\frac{1}{6}$ with a different color. I ended up with an answer of $\frac{3}{6}$, which is equal to $\frac{1}{2}$.



Based on the algorithm in the standard, when solving $\frac{1}{3} + \frac{1}{6}$, multiplying 3 and 6 gives a common denominator of 18. Students would make equivalent fractions $\frac{6}{18} + \frac{3}{18} = \frac{9}{18}$ which is also equal to one-half.

Teacher Note:
While multiplying the denominators will always give a common denominator, this may not result in the smallest denominator.

Students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators. They should know that multiplying the denominators will always give a common denominator but may not result in the smallest denominator.

Examples:

- $\frac{2}{5} + \frac{7}{8} = \frac{16}{40} + \frac{35}{40} = \frac{51}{40}$
- $3\frac{1}{4} - \frac{1}{6} = 3\frac{3}{12} - \frac{2}{12} = 3\frac{1}{12}$ or $3\frac{1}{4} - \frac{1}{6} = 3\frac{6}{24} - \frac{4}{24} = 3\frac{2}{24}$ or $3\frac{1}{12}$

Assessment Connections

Assessment Item Type(s): Type I, II, III

Evidence Statement(s): LEAP.I.5.2, LEAP.II.5.8, LEAP.III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Fractions with Unlike Denominators 5.NOF.A.1 LEAP II.5.8	Adds and subtracts **more than three** fractions and mixed numbers with unlike denominators in such a way as to produce an equivalent sum or difference with like denominators.	Adds and subtracts **up to three** fractions and adds and subtracts two mixed numbers with unlike denominators in such a way as to produce an equivalent sum or difference with like denominators.	Adds **and** subtracts two fractions or mixed numbers with unlike denominators in such a way as to produce an equivalent sum or difference with like denominators.	Adds or subtracts two fractions or mixed numbers with unlike denominators using only fractions with denominators of 2, 4, 5 or 10 in such a way as to produce an equivalent sum or difference with like denominators.

5.NOF.A.2 Solve real-world mathematical tasks involving addition and subtraction of fractions.

a. Add and subtract fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models, number line diagrams, or equations to represent the problem.
b. Use benchmark fractions and number sense of fractions to estimate mentally and justify the reasonableness of answers.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.A.2 **5th Grade Standard Taught in Advance:** 5.NOF.A.1 **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding (2b), Application (2, 2a)
Foundational Skills: 8. Add and subtract fractions with unlike denominators.		

Examples and Explanations

This standard is focused on using number sense in the context of solving real-world mathematical tasks. Students rely on their understanding of fractions as numbers that lie between whole numbers on a number line. Number sense in fractions also includes moving between decimals and fractions to find equivalents as well as being able to use reasoning such as $\frac{7}{8}$ is greater than $\frac{3}{4}$ because $\frac{7}{8}$ is missing only $\frac{1}{8}$ and $\frac{3}{4}$ is missing $\frac{1}{4}$ so $\frac{7}{8}$ is closer to a whole. Also, 5.NOF.A.2b indicates that students should use benchmark fractions to estimate and examine the reasonableness of their answers.

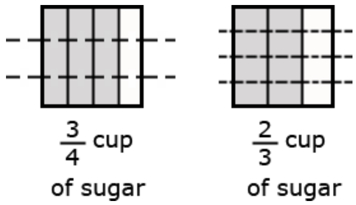
Examples:

- Jerry was making two different types of cookies. One recipe needed $\frac{3}{4}$ cup of sugar and the other needed $\frac{2}{3}$ cup of sugar. How much sugar did he need to make both recipes?

  Mental estimation:

  A student may say that Jerry needs more than 1 cup of sugar but less than 2 cups. An explanation may compare both fractions to $\frac{1}{2}$ and state that both are larger than $\frac{1}{2}$ so the total must be more than 1. In addition, both fractions are slightly less than 1 so the sum cannot be more than 2.

  Area model



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 situations using various estimation strategies. Estimation strategies for calculations with fractions extend from students' work with whole number operations and can be supported through the use of physical models.

Example:

- Ellie drank $\frac{3}{5}$ quart of milk and Javier drank $\frac{1}{10}$ quart less than Ellie. How much milk did Ellie and Javier drink all together?

  Solution:

  $\frac{3}{5} - \frac{1}{10} = \frac{6}{10} - \frac{1}{10} = \frac{5}{10}$ This is how much milk Javier drank

  $\frac{3}{5} + \frac{5}{10} = \frac{6}{10} + \frac{5}{10} = \frac{11}{10}$ Together they drank $1\frac{1}{10}$ quarts of milk

  This solution is reasonable because Ellie drank slightly more than $\frac{1}{2}$ quart and Javier drank $\frac{1}{2}$ quart, so together they drank slightly more than one quart.

- $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$ is an incorrect result since $\frac{3}{7} < \frac{1}{2}$.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.I.5.2, LEAP.II.5.8, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Add and Subtract Fractions to Solve Problems 5.NF.A.2 LEAP II.5.6 LEAP II.5.7 LEAP II.5.8	**Creates and** solves word problems involving addition and subtraction of fractions, referring to the same whole in cases of unlike denominators by using visual fraction models and equations.	Solves word problems involving addition and subtraction of fractions, referring to the same whole in cases of unlike denominators by using visual fraction models or equations.	Solves word problems involving addition and subtraction of fractions, referring to the same whole in cases of unlike denominators by using visual fraction models or equations.	Solves word problems involving addition and subtraction of fractions **using benchmark fractions** with unlike denominators, referring to the same whole by using visual fraction models or equations.

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions. In this cluster, the terms students should learn to use with increasing precision are **fraction, numerator, denominator, operation, mixed number, product, quotient, partition, equal parts, equivalent, factor, unit fraction, area, side lengths, fractional side lengths,** and **comparing.**

5.NOF.B.3 Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b}$ = a ÷ b). Solve real-world mathematical tasks involving division of whole numbers in the form of fractions to include fractions greater than one or mixed numbers, e.g., by using visual fraction models, number line diagrams, or equations to represent the problem.

Standard Overview

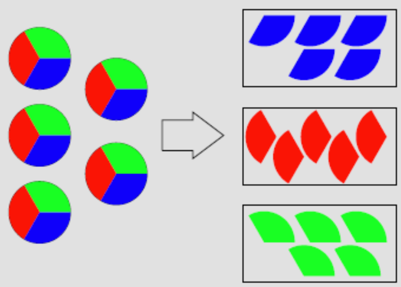
Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.A.1, 3.AR.A.2, 3.AR.B.6, 4.AR.A.1, 4.AR.A.2, 4.DM.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.NOF.B.4, 5.NOF.B.5	Conceptual Understanding, Application

Examples and Explanations

Fifth-grade students should connect fractions with division, understanding that 5 ÷ 3 = $\frac{5}{3}$.

Students should explain this by working with their understanding of division as equal sharing.

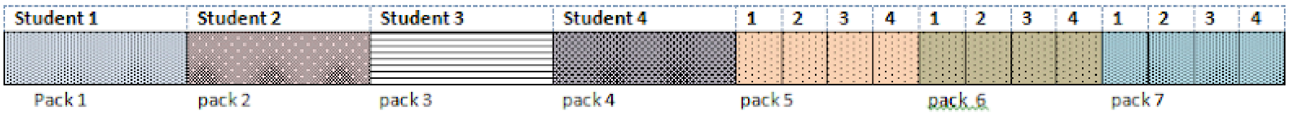
How to share 5 objects equally among 3 shares:
$5 \div 3 = 5 \times \frac{1}{3} = \frac{5}{3}$



If you divide 5 objects equally among 3 shares, each of the 5 objects should contribute $\frac{1}{3}$ of itself to each share. Thus each share consists of 5 pieces, each of which is $\frac{1}{3}$ of an object, and so each share is $5 \times \frac{1}{3} = \frac{5}{3}$ of an object.

Students should also create story contexts to represent problems involving division of whole numbers.

Example:
Your teacher gives 7 packs of paper to your group of 4 students. If you share the paper equally, how much paper does each student get?



Each student receives 1 whole pack of paper and $\frac{1}{4}$ of each of the 3 packs of paper. So each student gets $1\frac{3}{4}$ packs of paper.

Examples:

- Ten team members are sharing 3 boxes of cookies. How much of a box will each student get?
  When working this problem, a student should recognize that the 3 boxes are being divided into 10 groups. The student is seeing the solution to the following equation: $10 \cdot n = 3$ (10 groups of some amount is 3 boxes), which can also be written as $n = 3 \div 10$. Using models or diagrams, they divide each box into 10 groups, resulting in each team member getting $\frac{3}{10}$ of a box.
- Two after-school clubs are having pizza parties. For the Math Club, the teacher will order 3 pizzas for 5 students. For the Student Council, the teacher will order 5 pizzas for 8 students. Since you are in both groups, you need to decide which party to attend. How much pizza would you get at each party? If you want to have the most pizza, which party should you attend?
- The 6 fifth-grade classrooms have a total of 27 boxes of pencils. How many boxes will each classroom receive?
  Students may recognize this as a whole number division problem, but should also express this equal sharing problem as $\frac{27}{6}$. They explain that each classroom gets $\frac{27}{6}$ boxes of pencils and can further determine that each classroom gets $4\frac{1}{2}$ boxes of pencils.

Assessment Connections
Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.3, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Interpret Fractions 5.NOF.B.3 LEAP.II.5.3	Solves word problems involving division of whole numbers, leading to answers in the form of fractions or mixed numbers.	Solves word problems involving division of whole numbers, leading to answers in the form of fractions or mixed numbers.	Solves word problems involving division of whole numbers, leading to answers in the form of fractions or mixed numbers.	Solves word problems involving division of whole numbers, leading to answers in the form of fractions or mixed numbers by using manipulatives or visual models **to identify between which two whole numbers the answer lies.**
	Interprets the fraction as division of the numerator by the denominator.	Interprets the fraction as division of the numerator by the denominator.	**Interprets the fraction as division of the numerator by the denominator.**	
	Creates a model representing the situation.	**Identifies a simple model representing the situation.**		

5.NOF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product $(\frac{m}{n})$ x q as *m* parts of a partition of *q* into *n* equal parts; equivalently, as the result of a sequence of operations, m x q ÷ n.
b. Construct or critique a precise model to develop understanding of the concept of multiplying two fractions and create a story context for the equation.
   In general, $(\frac{m}{n})$ x $(\frac{c}{d})$ = $\frac{(mc)}{(nd)}$.

Standard Overview

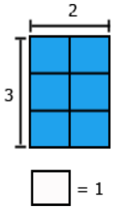
Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.D.11 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.NOF.B.3, 5.NOF.B.6, 5.NOF.B.7	Conceptual Understanding (4, 4a, 4b), Procedural Skill and Fluency (4)
Foundational Skills: 4. Multiply a fraction by a whole number or a fraction.		

Examples and Explanations

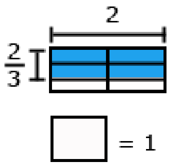
Students are expected to multiply fractions (including proper fractions, fractions greater than 1, but not mixed numbers) times a whole number. Students are also expected to multiply a fraction times a fraction because of the information found in part 2b. (Multiplication of mixed numbers is addressed in 5.NOF.B.6.) They multiply fractions efficiently and accurately.

Examples:

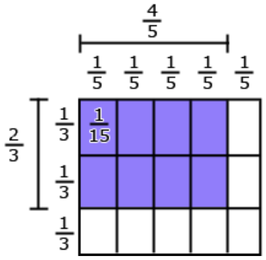
- As students multiply fractions such as $\frac{3}{5} \cdot 6$, they can think of the operation in more than one way.
  $3 \cdot (6 \div 5)$ or $(3 \cdot \frac{6}{5})$
  $(3 \cdot 6) \div 5$ or $18 \div 5$ or $\frac{18}{5}$
- Building on previous understandings of multiplication
  - Rectangle with dimensions of 2 and 3 showing that $2 \cdot 3 = 6$.



- Rectangle with dimensions of 2 and $\frac{2}{3}$ showing that $2 \cdot \frac{2}{3} = \frac{4}{3}$



- In solving the problem $\frac{2}{3} \times \frac{4}{5}$, students use an area model to visualize it as a 2 by 4 array of small rectangles, each of which has side lengths $\frac{1}{3}$ and $\frac{1}{5}$. They reason that $\frac{1}{3} \times \frac{1}{5} = \frac{1}{(3\times5)}$ by counting squares in the entire rectangle, so the area of the shaded space is $(2 \times 4) \times \frac{1}{(3\times5)} = \frac{(2\times4)}{(3\times5)}$.



The area model and the line segments show that the area is the same quantity as the product of the side lengths.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.3, LEAP.II.5.6, LEAP.II.5.7, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply and Divide Fractions to Solve Problems 5.NOF.B.4 5.NOF.B.6 5.NOF.B.7 LEAP.II.5.3 LEAP.II.5.6 LEAP.II.5.7	Solves real-world problems, by multiplying a mixed number by a fraction, a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; and interpreting the product and/or quotient.	**Solves real-world problems,** by multiplying a **mixed number by a fraction,** a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; **and interpreting the product and/or quotient.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models **and creating context for the mathematics, including rectangular areas.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models.

5.NOF.B.5 Interpret multiplication as scaling (resizing) by:

a. Comparing the size of a product to the size of one factor based on the size of the other factor, without performing the indicated multiplication.
b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case).
c. Explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number.
d. Relating the principle of fraction equivalence.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.A.1, 3.AR.A.2, 3.AR.B.6, 4.AR.A.1, 4.AR.A.2, 4.NOF.C.7, 4.DM.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.AR.A.2, 5.NOF.B.3, 5.NOF.B.6	Conceptual Understanding (5, 5a, 5b, 5c, 5d)
Foundational Skills: 4. Multiply a fraction by a whole number or a fraction.		

Examples and Explanations

This standard calls for students to examine the magnitude of products in terms of the relationship between two types of problems. This extends the work with 5.AR.A.2.

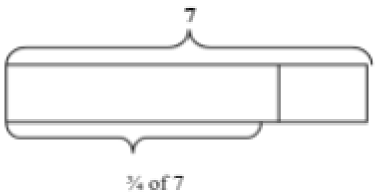
Examples:

- Mrs. Jones teaches in a room that is 60 feet wide and 40 feet long. Mr. Thomas teaches in a room that is half as wide, but has the same length. How do the dimensions and area of Mr. Thomas' classroom compare to Mrs. Jones' room? Draw a picture to prove your answer.
- How does the product of 225 · 60 compare to the product of 225 · 30? How do you know?
Solution: Since 30 is half of 60, the product of 225 · 60 will be double or twice as large as the product of 225 · 30.

This standard asks students to examine how numbers change when multiplying by fractions. Students should have ample opportunities to examine both cases in the standard: a) when multiplying by a fraction greater than 1, the number increases, and b) when multiplying by a fraction less than one, the number decreases. This standard should be explored and discussed while students are working with 5.NOF.B.4, and should not be taught in isolation.

Examples:

- Mrs. Bennett is planting two flower beds. The first flower bed is 5 meters long and 6/5 meters wide. The second flower bed is 5 meters long and 5/6 meters wide. How do the areas of these two flower beds compare? Is the value of the area larger or smaller than 5 square meters? Draw pictures to prove your answer.
- $\frac{3}{4} \times 7$ is less than 7 because 7 is multiplied by a factor less than 1, so the product must be less than 7.



- $2\frac{2}{3}$ x 8 must be more than 8 because 2 groups of 8 is 16, and $2\frac{2}{3}$ is almost 3 groups of 8. So the answer must be close to, but less than 24.
- $\frac{3}{4} = \frac{5\times3}{5\times4}$ because multiplying $\frac{3}{4}$ by $\frac{5}{5}$ is the same as multiplying $\frac{3}{4}$ by 1.

[Assessment Connections](#)
Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.8, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiplication Scaling 5.NOF.B.5a LEAP.II.5.8	Interprets multiplication scaling by comparing the size of the product to the size of one factor on the basis of the size of the second factor without performing the indicated multiplication with **two fractions.**	Interprets multiplication scaling by comparing the size of the product to the size of one factor on the basis of the size of the second factor **without performing the indicated multiplication, focusing on one factor being a fraction greater than or less than one.**	Interprets multiplication scaling by comparing the size of a product to the size of one factor on the basis of the size of the second factor by performing the indicated multiplication where one factor is a fraction less than one.	Interprets multiplication scaling by comparing the size of a product to the size of one factor on the basis of the size of the second factor **by performing the indicated multiplication** where one factor is a fraction less than one **using manipulatives or visual models.**

5.NOF.B.6 Represent and solve real-world mathematical tasks involving multiplication of fractions, including fractions greater than 1 and mixed numbers, e.g., by using visual fraction models, number line diagrams, or equations.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.A.1, 3.AR.A.2, 3.AR.B.6, 4.AR.A.1, 4.AR.A.2, 4.DM.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.NOF.B.4, 5.NOF.B.5, 5.NOF.B.7	Application
Foundational Skills: 4. Multiply a fraction by a whole number or a fraction.		

Examples and Explanations

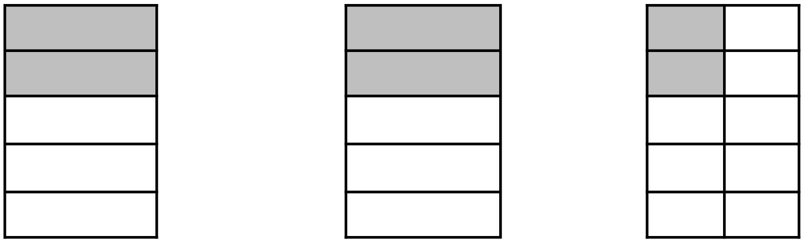
This standard builds on all of the work done in this cluster. Students should be given ample opportunities to use various strategies to solve word problems involving the multiplication of a fraction by a mixed number. This standard includes fraction by a fraction, fraction by a mixed number, mixed number by a mixed number, and whole number by a mixed number.

Examples:

- There are $2\frac{1}{2}$ busloads of students standing in the parking lot. The students are getting ready to go on a field trip. $\frac{2}{5}$ of the students on each bus are girls. How many buses would it take to carry ***only*** the girls?

  Sample Response:
  I drew 3 grids, and 1 grid represents 1 bus. I cut the third grid in half, and I marked out the right half, leaving $2\frac{1}{2}$ grids. I then cut each grid into fifths, and shaded $\frac{2}{5}$ of each grid to represent the number of girls. When I added up the shaded pieces, $\frac{2}{5}$ of the 1^{st} bus and 2^{nd} bus were both shaded, and 1/5 of the last bus was shaded.

$\frac{2}{5} + \frac{2}{5} + \frac{1}{5} = \frac{5}{5}$ = 1 whole bus.



- Evan bought 6 roses for his mother. $\frac{2}{3}$ of them were red. How many red roses were there?
    - o Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.

A student can use an equation to solve.

$\frac{2}{3} \times 6 = \frac{12}{3} = 4$ red roses.

- Comparing Heights of Buildings
- Drinking Juice
- New Park

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply and Divide Fractions to Solve Problems 5.NOF.B.4 5.NOF.B.6 5.NOF.B.7	Solves real-world problems, by multiplying a mixed number by a fraction, a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; and interpreting the product and/or quotient.	**Solves real-world problems,** by multiplying a **mixed number by a fraction,** a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; **and interpreting the product and/or quotient.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models **and creating context for the mathematics, including rectangular areas.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models.

5.NOF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions in the context of real-world mathematical tasks, e.g., by using visual fraction models, number line diagrams, or equations to represent the problem.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
b. Interpret division of a whole number by a unit fraction, and compute such quotients.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.B.6, 3.NOF.A.1, 4.NOF.D.11 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.NOF.B.4, 5.NOF.B.6	Conceptual Understanding (7, 7a, 7b), Procedural Skill and Fluency (7, 7a, 7b) Application (7)

Examples and Explanations

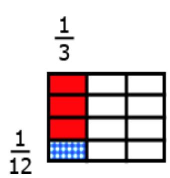
In fifth grade, students experience division problems with whole number divisors and unit fraction dividends (fractions with a numerator of 1) or with unit fraction divisors and whole number dividends. Students extend their understanding of the meaning of fractions and how many unit fractions are in a whole. They also extend their understanding of multiplication and division as involving equal groups or shares and the number of objects in each group/share. In sixth grade, they will use this foundational understanding to divide into and by more complex fractions and develop abstract methods of dividing by fractions.

Examples:

Knowing the number of groups/shares and finding how many/much in each group/share

- Four students sitting at a table were given $\frac{1}{3}$ of a pan of brownies to share. How much of a pan will each student get if they share the pan of brownies equally?

  The diagram shows the $\frac{1}{3}$ pan divided into 4 equal shares with each share equaling $\frac{1}{12}$ of the pan.



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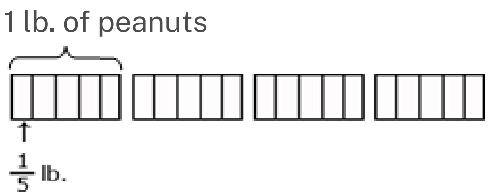
- Angelo has 4 lbs of peanuts. He wants to give each of his friends $\frac{1}{5}$ lb. How many friends can receive $\frac{1}{5}$ lb of peanuts?

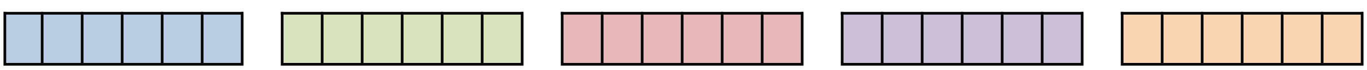
  A diagram for $4 \div \frac{1}{5}$ is shown below. Students explain that since there are five fifths in one whole, there must be 20 fifths in 4 lbs.

- Create a story context for $5 \div \frac{1}{6}$. Find your answer and then draw a picture to prove your answer, and use multiplication to reason about whether your answer makes sense. How many $\frac{1}{6}$ are in 5?

  Sample Response:
  A bowl holds 5 Liters of water. If we use a scoop that holds $\frac{1}{6}$ of a Liter, how many scoops will we need in order to fill the entire bowl?

  I created 5 boxes. Each box represents 1 Liter of water. I then divided each box into sixths to represent the size of the scoop. My answer is the number of small boxes, which is 30. That makes sense since 6 x 5 = 30.



  $1 = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$. A whole has $\frac{6}{6}$, so five wholes would be $\frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{6}{6} = \frac{30}{6}$

- How much rice will each person get if 3 people share $\frac{1}{2}$ lb of rice equally?

  Solution: $\frac{1}{2} \div 3 = \frac{3}{6} \div 3 = \frac{1}{6}$

  - A student may think or draw $\frac{1}{2}$ and cut it into 3 equal groups, and then determine that each of those parts is $\frac{1}{6}$.
  - A student may think of $\frac{1}{2}$ as equivalent to $\frac{3}{6}$. $\frac{3}{6}$ divided by 3 is $\frac{1}{6}$.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.3, LEAP.II.5.7, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply and Divide Fractions to Solve Problems 5.NOF.B.4 5.NOF.B.6 5.NOF.B.7 LEAP.II.5.3 LEAP.II.5.7	Solves real-world problems, by multiplying a mixed number by a fraction, a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; and interpreting the product and/or quotient.	**Solves real-world problems,** by multiplying a **mixed number by a fraction,** a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; **and interpreting the product and/or quotient.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models **and creating context for the mathematics, including rectangular areas.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models.

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

5.NOF.C.8 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.E.12, 4.NOF.E.13, 4.NOF.E.14, 4.NOF.A.1 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding
Foundational Skills: 5. Read and write decimals to the thousandths.		

Examples and Explanations

In fourth grade, students examined the relationships of the digits in numbers for whole numbers only by comparing the place value of a digit to the place value of the digit to the right. Comparing the values of digits to both the left and right of a given digit is the focus of this standard. This standard also extends this understanding to the relationship of decimal fractions. Students use base-ten blocks, pictures of base-ten blocks, and interactive images of base-ten blocks to manipulate and investigate the place value relationships. They use their understanding of unit fractions to compare decimal places and fractional language to describe those comparisons.

Before considering the relationship of decimal fractions, students express their understanding that in multi-digit whole numbers, a digit in one place represents 10 times what it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Examples:
A student thinks, "I know that in the number 5,555, the 5 in the tens place (5,5<u>5</u>5) represents 50 and the 5 in the hundreds place (5,<u>5</u>55) represents 500. So a 5 in the hundreds place is ten times as much as a 5 in the tens place, or a 5 in the tens place is $\frac{1}{10}$ of the value of a 5 in the hundreds place."

To extend this understanding of place value to their work with decimals, students use a model of one unit; they cut it into 10 equal pieces, shade in, or describe $\frac{1}{10}$ of that model using fractional language ("This is 1 out of 10 equal parts. So it is $\frac{1}{10}$. I can write this using $\frac{1}{10}$ or 0.1.”). They repeat the process by finding $\frac{1}{10}$ of a $\frac{1}{10}$ (e.g., dividing $\frac{1}{10}$ into 10 equal parts to arrive at $\frac{1}{100}$ or 0.01) and can explain their reasoning, “0.01 is $\frac{1}{10}$ of $\frac{1}{10}$, thus it is $\frac{1}{100}$ of the whole unit.”

In the number 55.55, each digit is 5, but the value of the digits is different because of the placement.

5	5	.	5	5

The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the ones place is $\frac{1}{10}$ of 50 and 10 times five tenths.

5	5	.	5	5

The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the tenths place is 10 times five hundredths.

Assessment Connections

Assessment Item Type(s): Type I, II, III

Evidence Statement(s): LEAP.I.5.1, LEAP.II.5.5, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Place Value 5.NOF.C.8 5.AR.C.4 LEAP.I.5.1	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left, uses whole number exponents to denote powers of 10 **and uses symbols to compare two powers of 10 expressed exponentially (compare 10^2 to 10^5).**	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left and uses whole number exponents to denote powers of 10.	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right or 1/10 of what it represents in the place to its left **and uses whole number exponents to denote powers of 10.**	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right or 1/10 of what it represents in the place to its left **by using manipulatives or visual models.**

5.NOF.C.9 Explain and apply patterns when multiplying or dividing by powers of 10.

a. Explain and apply patterns in the values of the digits in the product or the quotient when a decimal is multiplied or divided by a power of 10.
b. Use whole-number exponents to denote powers of 10.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** none **5th Grade Standard Taught in Advance:** 5.NOF.C.8 **5th Grade Standard Taught Concurrently:** 5.NOF.D.12, 5.NOF.D.14	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 5. Read and write decimals to the thousandths.		

Examples and Explanations

New at grade 5 is the use of whole number exponents to denote powers of 10. Students understand why multiplying by a power of 10 shifts the digits in a whole number or decimal that many places to the left. The ultimate goal is that students can automatically write the standard form of the answer if given a problem such as 5.16 x 10^2. Some curricula focus on the movement of the decimal point in patterns. Regardless of the approach, this skill should be developed based on student understanding of the changes in place values of the digits rather than on application of an algorithm. For example:

- Multiplying by 10^4 means to multiply the number by 10 four times. Multiplying by 10 once shifts every digit of the multiplicand one place to the left in the product (the product is ten times as large as the original number) because in the base-ten system, the value of each place is 10 times the value of the place to its right. So multiplying by 10 four times shifts every digit 4 places to the left, making the value of each digit 10,000 times as large as it was in the original number.
- Dividing by 10^4 means to divide the number by 10 four times. Dividing by 10 once shifts every digit of the dividend one place to the right in the quotient (the quotient is ten times as small as the original number) because in the base-ten system, the value of each place is 10 times the value of the place to its right. So dividing by 10 four times shifts every digit 4 places to the right, making the value of each digit 10,000 times as small as it was in the original number.

Patterns in the number of 0s in products and quotients of a whole number and a power of 10, and the location of the decimal point in products of decimals with powers of 10, can be explained in terms of place value. Because students have developed their understanding of and computations with decimals in terms of multiples rather than powers, connecting the terminology of multiples with that of powers affords connections between understanding of multiplication/division and exponentiation.

Examples:

- $10^0 = 1$
- $10^1 = 10$
- $2.1 \times 10^2 = 210$

- Students might write:

  $36 \cdot 10 = 36 \cdot 10^1 = 360$
  $36 \cdot 10 \cdot 10 = 36 \cdot 10^2 = 3{,}600$
  $36 \cdot 10 \cdot 10 \cdot 10 = 36 \cdot 10^3 = 36{,}000$
  $36 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 36 \cdot 10^4 = 360{,}000$

  $36 \div 10 = 36 \div 10^1 = 3.6$
  $36 \div 10 \div 10 = 36 \div 10^2 = 0.36$
  $36 \div 10 \div 10 \div 10 = 36 \div 10^3 = 0.036$
  $36 \div 10 \div 10 \div 10 \div 10 = 36 \div 10^4 = 0.0036$

- Students might think and/or say:
  I noticed that every time I multiplied by 10, I added a zero to the end of the number. That makes sense because each digit's value became 10 times larger. To make a digit 10 times larger, I have to move the decimal one place value to the right. To make a digit 10 times smaller, I have to move the decimal one place to the left.

- Students might think and/or say:
  When I multiplied 36 by 10, the 30 became 300, and the 6 became 60. The 36 became 360. So I had to add a zero at the end to have 3 represent 3 hundreds (instead of 3 tens), and 6 represent 6 tens (instead of 6 ones).

- Students should be able to use the same type of reasoning as above to explain why the following multiplication and division problems by powers of 10 make sense.

$523 \cdot 10^3 = 523{,}000$	The place value of 523 is increased by 3 places.
$5.223 \cdot 10^2 = 522.3$	The place value of 5.223 is increased by 2 places.
$52.3 \div 10^1 = 5.23$	The place value of 52.3 is decreased by one place.

Assessment Connections

Assessment Item Type(s): Type I, II, III

Evidence Statement(s): LEAP.I.5.1, LEAP.II.5.5, LEAP.III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Place Value 5.NOF.C.8 5.AR.C.4 LEAP.I.5.1	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left, uses whole number exponents to denote powers of 10 **and uses symbols to compare two powers of 10 expressed exponentially (compare 10^2 to 10^5).**	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left and uses whole number exponents to denote powers of 10.	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right or 1/10 of what it represents in the place to its left **and uses whole number exponents to denote powers of 10.**	In any multi-digit number, recognizes a digit in one place represents 10 times as much as it represents in the place to its right or 1/10 of what it represents in the place to its left **by using manipulatives or visual models.**

5.NOF.C.10 Extend place value understanding of the base-ten system to decimals.

a. Read and write decimals to thousandths using base-ten numerals, standard form, written form, unit form, and expanded form.
b. Compare and order multi-digit whole numbers and decimals to thousandths based on the values of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.E.11, 4.NOF.C.8 **5th Grade Standard Taught in Advance:** 5.NOF.C.8 **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding (5, 5a, 5b), Procedural Skill and Fluency (5, 5a)
Foundational Skills: 5. Read and write decimals to the thousandths. 6. Compare and order whole numbers and decimals, identifying greater than, less than, or equal to.		

Examples and Explanations

Students build on the understanding they developed in fourth grade to read, write, compare, and order decimals to thousandths. They connect their prior experiences with using decimal notation for fractions and addition of fractions with denominators of 10 and 100. They use concrete models and number lines to extend this understanding to decimals to the thousandths. Models may include base-ten blocks, place value charts, number lines, grids, pictures, drawings, manipulatives, technology-based, etc. They read decimals using fractional language and write decimals in fractional form, as well as in expanded notation, as shown in the standard (part a). This investigation leads them to understanding equivalence of decimals (0.8 = 0.80 = 0.800).

Example:

- 347.392 = $3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (\frac{1}{10}) + 9 \times (\frac{1}{100}) + 2 \times (\frac{1}{1000})$
- Some equivalent forms of 0.72 are:

$\frac{72}{100}$

$(\frac{7}{10}) + (\frac{2}{100})$

$7 \times (\frac{1}{10}) + 2 \times (\frac{1}{100})$

0.70 + 0.02

$(\frac{70}{100}) + (\frac{2}{100})$

0.720

$7 \times (\frac{1}{10}) + 2 \times (\frac{1}{100}) + 0 \times (\frac{1}{1000})$

$\frac{720}{1000}$

Students need to understand the size of decimal numbers and relate them to common benchmarks such as 0, 0.5 (0.50 and 0.500), and 1. Comparing tenths to tenths, hundredths to hundredths, and thousandths to thousandths is simplified if students use their understanding of fractions to compare and order decimals.

Examples:

- Comparing 0.25 and 0.17, students might think, "25 hundredths is more than 17 hundredths." They may also think that it is 8 hundredths more. They may write this comparison as 0.25 > 0.17 and recognize that 0.17 < 0.25 is another way to express this comparison.
- Comparing 0.207 to 0.26, a student might think, "Both numbers have 2 tenths, so I need to compare the hundredths. The second number has 6 hundredths, and the first number has no hundredths, so the second number must be larger." Another student might think while writing fractions, "I know that 0.207 is 207 thousandths (and may write $\frac{207}{1000}$). 0.26 is 26 hundredths (and may write $\frac{26}{100}$), but I can also think of it as 260 thousandths ($\frac{260}{1000}$). So, 260 thousandths is more than 207 thousandths."

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.I.5.1, LEAP.II.5.5, LEAP.III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Read, Write, and Compare Decimals 5.AR.C.5 5.NOF.C.9	Reads, writes, and compares decimals to **any place** using numerals and symbols and rounds to any place and chooses appropriate context given a rounded number.	Reads, writes, and compares decimals to the **thousandths** using numerals, number names, expanded form and symbols (>, <, =) and rounds to any place.	Reads, writes, and compares decimals to the **hundredths** using numerals, number names, expanded form and symbols (>, <, =), and rounds to any place with scaffolding.	Reads, writes, and compares decimals to the **tenths** using numerals, number names, expanded form and symbols (>, <, =), and **rounds to any place with scaffolding**.

5.NOF.C.11 Use place value understanding to

a. Round multi-digit numbers with decimals to any place; and
b. Use estimation to reason about solutions to real-world mathematical tasks.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.A.3 **5th Grade Standard Taught in Advance:** 5.NOF.C.8, 5.NOF.C.10 **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency
Foundational Skills: 7. Estimate and round multi-digit numbers with decimals to any place.		

Examples and Explanations

This standard refers to rounding. **Students should go beyond simply applying 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 to support their work with rounding.

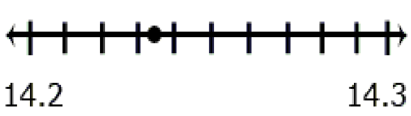
When rounding a decimal to a given place, students may identify the two possible answers and use their understanding of place value to compare the given number to the possible answers.

Students may use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0, 0.5, 1, 1.5 are examples of benchmark numbers.

Example:

- Round 14.235 to the nearest tenth.

  Students recognize that the possible answer must be in tenths; thus, it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).



Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.I.5.1, LEAP.II.5.5, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Read, Write, and Compare Decimals 5.NOF.C.10 5.NOF.C.11	Reads, writes, and compares decimals to **any place** using numerals and symbols and rounds to any place and chooses appropriate context given a rounded number.	Reads, writes, and compares decimals to the **thousandths** using numerals, number names, expanded form and symbols (>, <, =) and rounds to any place.	Reads, writes, and compares decimals to the **hundredths** using numerals, number names, expanded form and symbols (>, <, =), and rounds to any place with scaffolding.	Reads, writes, and compares decimals to the **tenths** using numerals, number names, expanded form and symbols (>, <, =), and **rounds to any place with scaffolding**.

D. Perform operations with multi-digit whole numbers with decimals to hundredths. In this cluster, the terms students should learn to use with increasing precision are **decimal, decimal point, tenths, hundredths, product, quotient, dividend, divisor, factor, rectangular array, area model, properties,** and **reasoning.**

5.NOF.D.12 Fluently multiply multi-digit whole numbers using a standard algorithm.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.F.10, 4.AR.D.11 **5th Grade Standard Taught in Advance:** 5.NOF.C.8 **5th Grade Standard Taught Concurrently:** 5.NOF.C.9, 5.NOF.D.14	Procedural Skill and Fluency
Foundational Skills: 2. Fluently multiply multi-digit whole numbers using a standard algorithm.		

Examples and Explanations

In prior grades, students used various strategies to multiply. Students can continue to use these different strategies as long as they are efficient, but must also understand and be able to use a standard algorithm. In applying a standard algorithm, students recognize the importance of place value.

This standard refers to fluency, which means accuracy (correct answer), efficiency (a reasonable amount of steps), and flexibility (using strategies such as the distributive property or breaking numbers apart also using strategies according to the numbers in the problem, e.g., $26 \cdot 4$ may lend itself to $(25 \cdot 4) + 4$ where as another problem might lend itself to making an equivalent problem $32 \cdot 4 = 64 \cdot 2$). This standard builds upon students' work with multiplying numbers in third and fourth grade. In fourth grade, students developed understanding of multiplication through using various strategies. While a standard algorithm is mentioned, alternative strategies are also appropriate to help students develop conceptual understanding. Students can continue to use these different strategies as long as they are efficient, but must also understand and be able to use a standard algorithm. In applying a standard algorithm, students recognize the importance of place value.

Example:

- $123 \cdot 34$. When students apply a standard algorithm, they decompose 34 into 30 + 4. They multiply 123 by 4, the value of the number in the ones place, multiply 123 by 30, the value of the 3 in the tens place, and then add the two products.

Examples of alternative strategies and explanations for 225 × 12

Student 1
225 · 12
I broke 12 up into 10 and 2.
225 · 10 = 2,250
225 · 2 = 450
2,250 + 450 = 2,700

Student 2
225 · 12
I broke up 225 into 200 and 25.
200 · 12 = 2,400
I broke 25 up into 5 · 5, so I had 5 · 5 · 12 or 5 · 12 · 5.
5 · 12= 60. 60 · 5 = 300
I then added 2,400 and 300
2,400 + 300 = 2,700.

Student 3
I doubled 225 and cut 12 in half to get 450 · 6. I then doubled 450 again and cut 6 in half to get 900 · 3.
900 · 3 = 2,700.

- Draw an array model for 225 · 12

	200	20	5
10	2,000	200	50
2	400	40	10

$$\begin{array}{r} 2{,}000 \\ 400 \\ 200 \\ 40 \\ 50 \\ \underline{+\ 10} \\ 2{,}700 \end{array}$$

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply Whole Numbers 5.NOF.D.10	Fluently multiplies a three-digit by a **two**-digit whole number using the standard algorithm.	**Fluently** multiplies a three-digit by a one-digit whole number **using the standard algorithm.**	Multiplies **a three-digit by a one-digit whole number.**	Multiplies whole numbers.

5.NOF.D.13 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value understanding, the properties of operations, subtracting multiples of the divisor, and/or the relationship between multiplication and division.

a. Illustrate and/or explain the calculation by using equations, rectangular arrays, area models, or other strategies based on place value understanding.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.F.10, 4.NOF.B.6 **5th Grade Standard Taught in Advance:** 5.NOF.C.8, 5.NOF.D.12 **5th Grade Standard Taught Concurrently:** 5.NOF.D.14	Conceptual Understanding, Procedural Skill and Fluency

Examples and Explanations

This standard references various strategies for division. Division problems can include remainders. In fourth grade, students' experiences with division were limited to dividing by one-digit divisors. This standard extends students' prior experiences with strategies, illustrations, and explanations. When the two-digit divisor is a "familiar" number, students might decompose the dividend using place value.

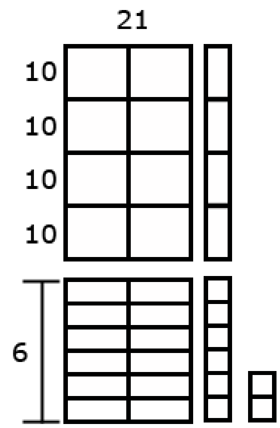
Examples:

- 2682 ÷ 25

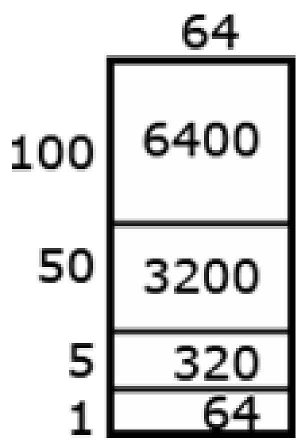
  Using expanded notation, a student might think: 2682 ÷ 25 = (2000 + 600 + 80 + 2) ÷ 25.
  Using his or her understanding of the relationship between 100 and 25, a student might then think:
  I know that 100 divided by 25 is 4, so 200 divided by 25 is 8, and 2000 divided by 25 is 80.
  600 divided by 25 has to be 24.
  Since 3 · 25 is 75, I know that 80 divided by 25 is 3 with a reminder of 5.
  (Note: a student might divide into 82 and not 80.)
  I can't divide 2 by 25, so 2 plus the 5 leaves a remainder of 7.
  80 + 24 + 3 = 107. So, the answer is 107 with a remainder of 7.

  Using an equation that relates division to multiplication, $25 \times n = 2682$, a student might estimate the answer to be slightly larger than 100 because she recognizes that 25 × 100 = 2,500.

- 968 ÷ 21
  Using base-ten models, a student can represent 962 and use the models to make an array with one dimension of 21. The student continues to make the array until no more groups of 21 can be made. Remainders are not part of the array.



- 9,984 ÷ 64
  An area model for division is shown below. As the student uses the area model, he or she keeps track of how much of 9,984 is left to divide.



Students must recognize that they must add the partial products of 100, 50, 5, and 1 to find the solution to 9,984 ÷ 64.

- Examples of alternative strategies and explanations for 1,716 ÷ 16.

Student 1

1,716 divided by 16
There are 100 16's in 1,716.
1,716 – 1,600 = 116
I know there are at least 6 16's.
116 – 96 = 20
I can take out at least 1 more 16.
20 – 16 = 4
There were 107 teams with 4 students left over. If we put the extra students on different teams, 4 teams will have 17 students.

Student 2

1,716 – 1,600	100
116 – 80	5
36 – 32	2
4	

1,716 divided by 16.
There are 100 16's in 1,716.
Ten groups of 16 is 160. That's too big.
Half of that is 80, which is 5 groups.
I know that 2 groups of 16's is 32.
I would have 107 groups of 16 with 4 students left over. I could make 4 of the groups have 17 instead of 16.

Student 3

1,716 ÷ 16 =
I want to get to 1,716.
I know that 100 16's equals 1,600.
I know that 5 16's equals 80.
1,600 + 80 = 1,680
Two more groups of 16's equals 32, which gets us to 1,712.
I am 4 away from 1,716.
So we had 100 + 6 + 1 = 107 teams.
Those other 4 students can just hang out.

Student 4

How many 16's are in 1,716?
We have an area of 1,716. I know that one side of my array is 16 units long. I used 16 as the height. I am trying to answer the question, "What is the width of my rectangle if the area is 1,716 and the height is 16?"

	100	7
16	100 · 16 = 1,600	7 · 16 =112
	1,716 – 1,600 = 116	116 – 112 = 4

100 + 7 = 107, so my answer is 107 R 4.
The 4 students left over could each be assigned to give out drinks to four teams each.

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.1, LEAP.II.5.3, LEAP.II.5.6, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Quotients and Dividends 5.AR.D.6	Divides whole numbers up to four-digit dividends and two-digit divisors using strategies based on place value, the properties of operations and/or the relationship between multiplication and division.	Divides whole numbers up to four-digit dividends and **two**-digit divisors using strategies based on place value, the properties of operations and/or the relationship between multiplication and division.	Divides whole numbers up to **four-digit** dividends and one-digit divisors, where the dividend is a multiple of ten and uses strategies based on place value, the properties of operations and/or the relationship between multiplication and division.	Divides whole numbers up to three-digit dividends and one-digit divisors, **where the dividend is a multiple of ten** and uses strategies based on place value, the properties of operations and/or the relationship between multiplication and division.
	Illustrates and explains the calculations by using equations, rectangular arrays, and area models.	**Illustrates and explains the calculations by using equations, rectangular arrays, and area models.**		
	Checks reasonableness of answers with multiplication or estimation.	**Checks reasonableness of answers with multiplication or estimation.**		
	Identifies correspondences between approaches.			

5.NOF.D.14 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value understanding, properties of operations, and/or the part-whole relationship between addition and subtraction or multiplication and division.

a. Justify the reasoning of methods used for calculation with a written explanation.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.F.10 **5th Grade Standard Taught in Advance:** 5.NOF.C.8, 5.NOF.A.1, 5.NOF.B.4, 5.NOF.B.7 **5th Grade Standard Taught Concurrently:** 5.NOF.C.9, 5.NOF.D.12, 5.NOF.D.13	Conceptual Understanding (7, 7a), Procedural Skill and Fluency (7)
Foundational Skills: 7. Estimate and round multi-digit numbers with decimals to any place.		

Examples and Explanations

This standard requires students to extend the models and strategies they developed for whole numbers in grades 1-5 to decimal values. Before students are asked to give exact answers, they should estimate answers based on their understanding of operations and the value of the numbers.

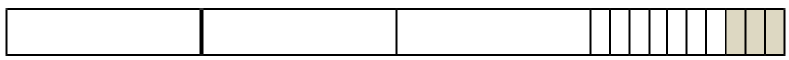
Examples:

- $3.6 + 1.7$
  A student might estimate the sum to be larger than 5 because 3.6 is more than $3\frac{1}{2}$, and 1.7 is more than $1\frac{1}{2}$.
- $5.4 - 0.8$
  A student might estimate the answer to be a little more than 4.4 because a number less than 1 is being subtracted.
- 6×2.4
  A student might estimate an answer between 12 and 18 since 6×2 is 12 and 6×3 is 18. Another student might give an estimate of a little less than 15 because he or she figures the answer to be very close, but smaller than $6 \times 2\frac{1}{2}$ and thinks of $2\frac{1}{2}$ groups of 6 as 12 (2 groups of 6) + 3 ($\frac{1}{2}$ of a group of 6).

Students should be able to express that when they add decimals, they add tenths to tenths and hundredths to hundredths. So, when they are adding in a vertical format (numbers beneath each other), it is important that they write numbers with the same place value beneath each other. This understanding can be reinforced by connecting addition of decimals to their understanding of addition of fractions. Adding fractions with denominators of 10 and 100 is a standard in fourth grade.

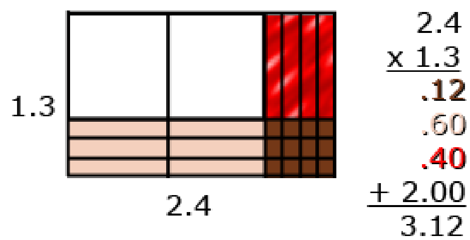
Examples:

- 4 – 0.3
  3 tenths subtracted from 4 wholes. The wholes must be divided into tenths.



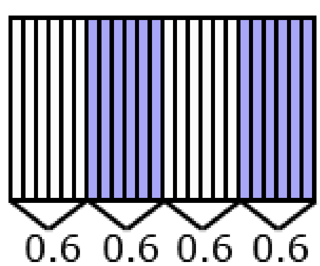
  The answer is 3 $\frac{7}{10}$ or 3.7.

- 2.4 × 1.3
  An area model can be useful for illustrating products.

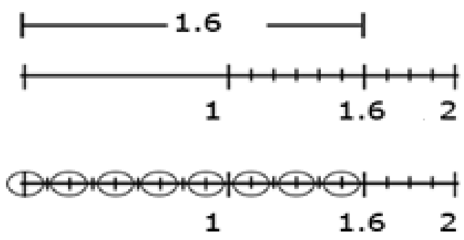


  Students should be able to describe the partial products displayed by the area model. For example, "$\frac{3}{10}$ times $\frac{4}{10}$ is $\frac{12}{100}$. $\frac{3}{10}$ times 2 is $\frac{6}{10}$ or $\frac{60}{100}$. 1 group of $\frac{4}{10}$ is $\frac{4}{10}$ or $\frac{40}{100}$. 1 group of 2 is 2."

- Finding the number in each group or share
  Students should be encouraged to apply a fair sharing model, separating decimal values into equal parts, such as:

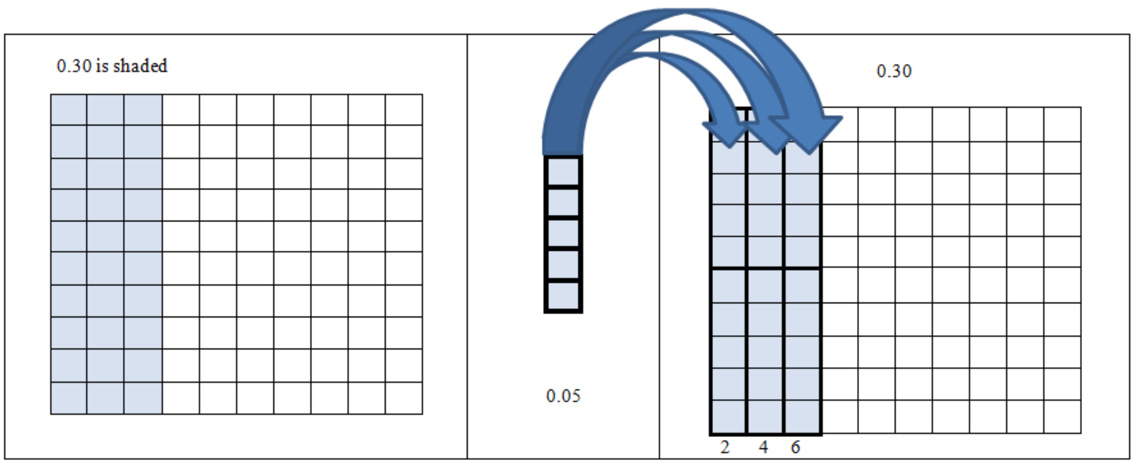


- Draw a model to show 1.6 ÷ 0.2
    - Draw a segment to represent 1.6. In doing so, a student counts in tenths to identify the 6 tenths and identifies the number of 2 tenths within 6 tenths. The student can then extend the idea of counting by tenths to divide the one into tenths and determine there are 5 more groups of 2 tenths.



    - Count groups of 2 tenths without the use of models or diagrams. Knowing that 1 can be thought of as $\frac{10}{10}$, a student might think of 1.6 as 16 tenths. Counting 2 tenths, 4 tenths, 6 tenths, . . . 16 tenths, a student can count 8 groups of 2 tenths.
    - Use understanding of multiplication. A student thinks, "8 groups of 2 is 16, so 8 groups of $\frac{2}{10}$ is $\frac{16}{10}$ or 1 $\frac{6}{10}$."

- Use an area model (10 × 10 grid) to show 0.30 ÷ 0.05.
  This model helps make it clear why the solution is larger than the number the student is dividing. The decimal 0.05 is partitioned into 0.30 six times.
  0.30 ÷ 0.05 = 6



Assessment Connections

Assessment Item Type(s): Type I, II, III

Evidence Statement(s): LEAP.II.5.2, LEAP.II.5.4, LEAP.II.5.6, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiplication and Division with Decimals 5.AR.D.7	Multiplies tenths by tenths or tenths by hundredths and divides in problems involving tenths and/or hundredths using strategies based on place value, properties of operations and/or the relationship between addition and subtraction.	Multiplies tenths by tenths **or tenths by hundredths** and divides in problems involving tenths **and/or hundredths** using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction.	Multiplies tenths by tenths and divides in problems involving tenths using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction.	Multiplies tenths by tenths and divides in problems involving tenths using concrete models or drawings and strategies based on place value, properties of operations and/or the relationship between addition and subtraction.
	Relates the strategy to a written method.	Relates the strategy to a written method.	**Relates the strategy to a written method.**	

Algebraic Reasoning

A. Write and interpret numerical expressions. In this cluster, the terms students should learn to use with increasing precision are **parentheses, brackets, braces, numerical expression, expression, evaluate,** and **grouping symbols**.

5.AR.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols, attending to the order of operations and the properties of operations.

a. Compare two simple expressions using >, =, or < to record the comparison of expressions limited to three operations and one grouping symbol.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** none **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding (1), Procedural Skill and Fluency (1, 1a)
Foundational Skills: 1. Evaluate and compare simple expressions.		

Examples and Explanations

This standard builds on the expectations of third grade, where students are expected to start learning the conventional order for performing operations. Students need experiences with multiple expressions that use grouping symbols throughout the year to develop an understanding of when and how to use parentheses, brackets, and braces. First, students use these symbols with whole numbers. Then the symbols can be used as students add, subtract, multiply, and divide decimals and fractions. Students should know the order in which to execute the operations in simple expressions with no grouping symbols.

Examples:

- $(26 + 18) \div 4$ *Answer: 11*
- $12 - 0.4 \cdot 2$ *Answer: 11.2*
- $(2 + 3) \cdot (1.5 - 0.5)$ *Answer: 5*
- $6 - \left(\frac{1}{2} + \frac{1}{3}\right)$ *Answer:* $5\frac{1}{6}$
- $80 \div \left[2 \times \left(3\frac{1}{2} + 1\frac{1}{2}\right)\right] + 100$ *Answer: 108*

To further develop students' understanding of grouping symbols and facility with operations, students place grouping symbols in equations to make the equations true, or they compare expressions that are grouped differently.

Examples:

- Insert parentheses to make the equation true. $15 - 7 - 2 = 10 \rightarrow 15 - (7 - 2) = 10$
- Insert grouping symbols to make the equation true. $3 \cdot 125 \div 25 + 7 = 22 \rightarrow [3 \cdot (125 \div 25)] + 7 = 22$

Assessment Connections

Assessment Item Type(s): Type I

Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Write and Interpret Numerical Expressions 5.AR.A.1 5.AR.A.2	Uses parentheses or brackets to write and evaluate numerical expressions.	Uses parentheses or brackets to write **and/or** evaluate numerical expressions.	Uses parentheses or brackets to write **or** evaluate numerical expressions.	Uses parentheses or brackets to write simple numerical expressions.
	Interprets numerical expressions without evaluating them.	Interprets numerical expressions without evaluating them.	**Interprets simple numerical expressions without evaluating them.**	

5.AR.A.2 Write simple expressions that record calculations with whole numbers, fractions, and decimals, and interpret numerical expressions without evaluating them.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** none **5th Grade Standard Taught in Advance:** 5.AR.A.1 **5th Grade Standard Taught Concurrently:** 5.NOF.B.5	Conceptual Understanding
Foundational Skills: 1. Evaluate and compare simple expressions.		

Examples and Explanations

Students use their understanding of operations and grouping symbols to write expressions and interpret the meaning of a numerical expression. Expressions are a series of numbers and symbols (+, –, ·, ÷) without an equal sign. Equations result when two expressions are set equal to each other (2 + 3 = 4 + 1). For example:

> 4(5 + 3) is an expression.
> When a student computes 4(5 + 3), he or she is evaluating the expression. The expression equals 32.
> 4(5 + 3) = 32 is an equation.

Examples:

- Write an expression for “double five and then add 26.”
- Express the calculation “add 8 and 7, then multiply by 2” as 2 × (8+7).
- Write an expression for calculations given in words such as “divide 144 by 12, and then subtract $\frac{7}{8}$.” A student writes (144 ÷ 12) – $\frac{7}{8}$ or 144 ÷ 12 – $\frac{7}{8}$.
- Compare 3 · 2 + 5 and 3 · (2 + 5).
- Compare 15 – 6 + 7 and 15 – (6 + 7).
- Describe how 0.5 · (300 ÷ 15) relates to 300 ÷ 15.
- A student recognizes that 3 × (18,932 + 9.21) is three times as large as 18,932 + 9.21 without having to calculate the indicated sum or product.

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Write and Interpret Numerical Expressions 5.AR.A.1 5.AR.A.2	Uses parentheses or brackets to write and evaluate numerical expressions.	Uses parentheses or brackets to write **and/or** evaluate numerical expressions.	Uses parentheses or brackets to write **or** evaluate numerical expressions.	Uses parentheses or brackets to write simple numerical expressions.
	Interprets numerical expressions without evaluating them.	Interprets numerical expressions without evaluating them.	**Interprets simple numerical expressions without evaluating them.**	

B. Analyze patterns and relationships. In this cluster, the terms students should learn to use with increasing precision are **numerical pattern, rule, ordered pair, coordinate plane, corresponding terms,** and **sequence**.

5.AR.B.3 Generate and extend two numerical patterns using two given rules. Identify apparent relationships between corresponding terms.

a. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.
b. Explain these relationships informally.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 4.AR.C.5 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding, Procedural Skill and Fluency

Examples and Explanations

This standard extends the work from fourth grade, where students generate numerical patterns when they are given one rule. In fifth grade, students are given two rules and generate two numerical patterns.

Examples:

- Starting with 0, use the rule "add 3" to write a sequence of numbers. Students write 0, 3, 6, 9, 12, ...
- Starting with 0, use the rule "add 6" to write a sequence of numbers. Students write 0, 6, 12, 18, 24, ...

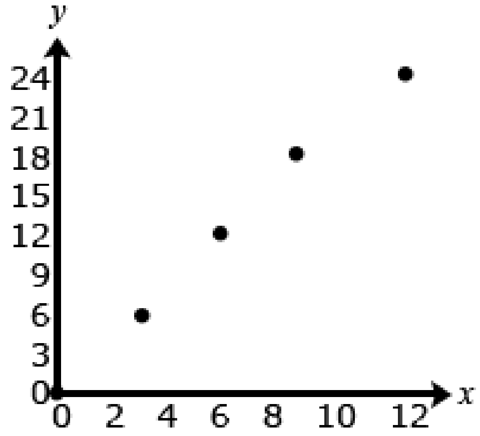
  After comparing these two sequences, the students notice that each term in the second sequence is twice the corresponding term of the first sequence. One way they justify this is by describing the patterns of the terms. Their justification may include some mathematical notation (see example below). Students may explain that both sequences start with zero, and to generate each term of the second sequence, they added 6, which is twice as much as was added to produce the terms in the first sequence. Students may also use the distributive property to describe the relationship between the two numerical patterns by reasoning that $6 + 6 + 6 = 2 \times (3 + 3 + 3)$.

  0, $^{+3}$ 3, $^{+3}$ 6, $^{+3}$ 9, $^{+3}$12, ...

  0, $^{+6}$ 6, $^{+6}$ 12, $^{+6}$18, $^{+6}$ 24, ...

  Once students can describe that each term of the second sequence of numbers is twice the corresponding term of the first sequence, the terms can be written in ordered pairs and then graphed on a coordinate plane. They should recognize that each point on the graph represents two quantities, where the second quantity is twice the first quantity.

Ordered pairs: (0, 0), (3, 6), (6, 12), (9, 18), (12, 24)



Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Coordinate Plane 5.GL.A.1 5.GL.A.2 5.AR.B.3	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane and interprets coordinate values of points in the context of the situation.	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane **and interprets coordinate values of points in the context of the situation.**	Represents real-world and mathematical problems by locating **and** graphing points in the first quadrant of a coordinate plane.	Represents real-world and mathematical problems by locating or graphing points in the first quadrant of a coordinate plane.

Geometric Reasoning & Logic

A. Graph points on a coordinate plane to solve real-world and mathematical tasks. In this cluster, the terms students should learn to use with increasing precision are **coordinate system, coordinate plane, first quadrant, point, line, axis/axes, x-axis, y-axis, horizontal, vertical, intersection of lines, origin, ordered pair, coordinate, x-coordinate,** and **y-coordinate**.

5.GL.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates.

- Understand that in an ordered pair, the first number shows how far to move along the x-axis, and the second number shows how far to move along the y-axis from the origin. With this convention, the names of the two axes and the coordinates correspond.

Standard Overview

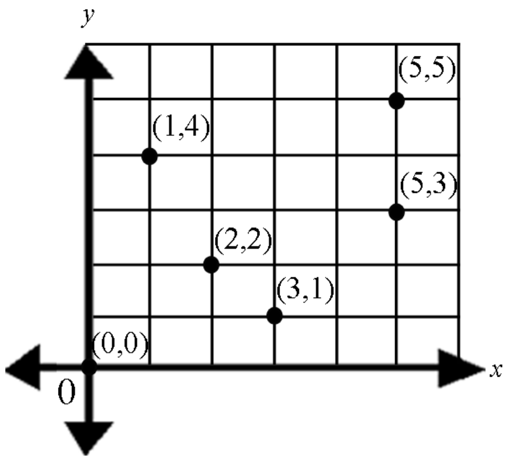
Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 3.NOF.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.GL.A.2	Conceptual Understanding

Examples and Explanations

In Grade 5, students work with a coordinate plane that is limited to **Quadrant I**, where both coordinates are positive numbers. Students learn to locate and plot points using ordered pairs (x,y)(x, y)(x,y) and interpret the relationship between the x-coordinate and y-coordinate. Limiting work to Quadrant I allows students to focus on understanding the structure of the coordinate system before extending their learning to negative numbers and the other quadrants in later grades.

Examples:

- Students can use a classroom size coordinate system to physically locate the coordinate point (5, 3) by starting at the origin (0, 0), walking 5 units along the x-axis to find the first number in the pair (5), and then walking up 3 units to find the second number in the pair (3). The ordered pair names a point in the plane.



- Graph and label the points below in a coordinate system.
  - A (0, 0)
  - B (5, 1)
  - C (0, 6)
  - D (6, 2)
  - E (4, 1)
  - F (3, 0)

Assessment Connections

Assessment Item Type(s): Type I

Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Coordinate Plane 5.GL.A.1 5.GL.A.2 5.AR.B.3	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane and interprets coordinate values of points in the context of the situation.	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane **and interprets coordinate values of points in the context of the situation.**	Represents real-world and mathematical problems by locating **and** graphing points in the first quadrant of a coordinate plane.	Represents real-world and mathematical problems by locating or graphing points in the first quadrant of a coordinate plane.

5.GL.A.2 Represent real-world mathematical tasks by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Standard Overview

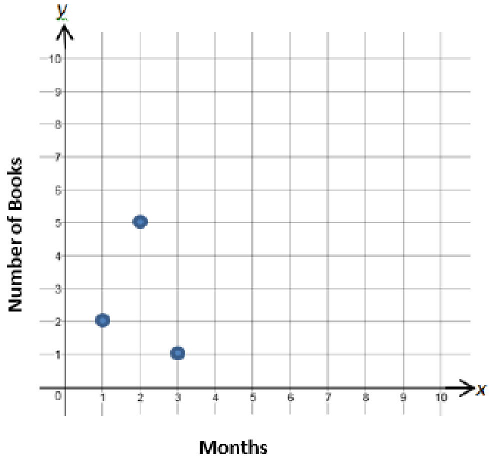
Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 3.NOF.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.GL.A.1	Conceptual Understanding, Procedural Skill and Fluency

Examples and Explanations

This standard references real-world mathematical tasks.

Example:

- Judah's mom is worried that he's not reading enough, so she asks him to keep track of the number of books he reads each month. Judah uses the graph below to keep track of the number of books he reads each month.



a) What does the point (2, 5) represent? (*Judah reads 5 books in the 2nd month.)*

b) If Judah reads zero books in the 5th month, what ordered pair would he need to graph? *(5, 0)*

c) Judah realized he read two more books in the 3rd month than is represented on his graph. What order pair does Judah need to graph to correct his mistake? *(3, 3)*

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Coordinate Plane 5.GL.A.1 5.GL.A.2 5.AR.B.3	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane and interprets coordinate values of points in the context of the situation.	Represents real-world and mathematical problems by locating and graphing points in the first quadrant of a coordinate plane **and interprets coordinate values of points in the context of the situation.**	Represents real-world and mathematical problems by locating **and** graphing points in the first quadrant of a coordinate plane.	Represents real-world and mathematical problems by locating or graphing points in the first quadrant of a coordinate plane.

B. Classify two-dimensional figures into categories based on their properties. In this cluster, the terms students should learn to use with increasing precision are **attribute, category, subcategory, hierarchy, properties, parallel, perpendicular, congruent, symmetry, polygon, parallelogram, quadrilateral, right angle,** and **two-dimensional**.

5.GL.B.3 Understand, analyze and relate attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** 3.GL.A.1, 4.GL.A.2 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding

Examples and Explanations

Geometric properties include properties of sides (parallel, perpendicular, and congruent), properties of angles (type, measurement, and congruent), and properties of symmetry (point and line).

Examples:

- If the opposite sides of a parallelogram are parallel and congruent, then rectangles are parallelograms.
- All rectangles have four right angles, and squares are rectangles, so all squares have four right angles.
- A sample of questions that might be posed to students includes:
    - A parallelogram has 4 sides with both sets of opposite sides parallel. What types of quadrilaterals are parallelograms?
    - Regular polygons have all of their sides and angles congruent. Name or draw some regular polygons.
    - All rectangles have 4 right angles. Squares have 4 right angles, so they are also rectangles. True or False?
    - A trapezoid has 2 sides parallel, so it must be a parallelogram. True or False?

[Assessment Connections](#)

Assessment Item Type(s): Type I

Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Two-Dimensional Figures 5.GL.B.3 5.GL.B.4	Classifies two-dimensional figures in a hierarchy based on properties.	Classifies two-dimensional figures in a hierarchy based on properties.	Classifies two-dimensional figures **in a hierarchy** based on properties.	Classifies two-dimensional figures based on properties.
	Demonstrates that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.	**Understands that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.**	**Understands that shared attributes categorize two-dimensional figures.**	
	Uses appropriate tools to determine similarities and differences between categories and subcategories.			

5.GL.B.4 Classify quadrilaterals in a hierarchy based on properties.

a. Justify the reasoning for classification with a written response.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Additional Content	**Previous Grade(s) Standard:** none **5th Grade Standard Taught in Advance:** 5.GL.B.3 **5th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency

Examples and Explanations

This standard builds on what was done in 4th grade by having students formalize their understanding of the relationships among quadrilaterals. Figures from previous grades are **polygon, regular polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle,** and **kite**.

Students will define a **trapezoid** as a quadrilateral with at least one pair of parallel sides. In addition, 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.

Teacher Note: In the U.S., the term "trapezoid" may have two different meanings. Research identifies these as inclusive and exclusive definitions. Louisiana has adopted the inclusive definition. The inclusive definition states: A trapezoid is a quadrilateral with *at least* one pair of parallel sides.

Example:

- Create a Hierarchy Diagram using the following terms:

quadrilateral – a four-sided polygon

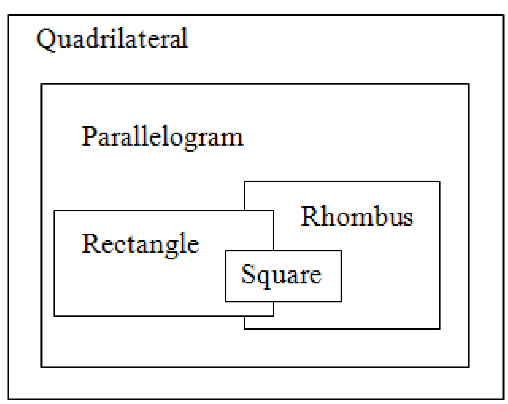
parallelogram – a quadrilateral with two pairs of parallel and congruent sides

rectangle – a quadrilateral with two pairs of congruent, parallel sides and four right angles

rhombus – a parallelogram with all four sides equal in length

square – a parallelogram with four congruent sides and four right angles

Possible student solution:



Students should be able to reason about the attributes of shapes by examining: Why aren't kites classified as parallelograms? Which quadrilaterals have opposite angles congruent, and why is this true of certain quadrilaterals?

[Assessment Connections]

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Two-Dimensional Figures 5.GL.B.3 5.GL.B.4	Classifies two-dimensional figures in a hierarchy based on properties.	Classifies two-dimensional figures in a hierarchy based on properties.	Classifies two-dimensional figures **in a hierarchy** based on properties.	Classifies two-dimensional figures based on properties.
	Demonstrates that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.	**Understands that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.**	**Understands that shared attributes categorize two-dimensional figures.**	
	Uses appropriate tools to determine similarities and differences between categories and subcategories.			

Data Analysis & Measurement

A. Convert like measurement units within a given measurement system. In this cluster, the terms students should learn to use with increasing precision are **conversion/convert, metric unit, customary unit. From previous grades: relative size, liquid volume, mass, length, kilometer (km), meter (m), centimeter (cm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in.), foot (ft.), yard (yd), mile (mi), ounce (oz), pound (lb), cup (c), pint (pt), quart (qt), gallon (gal), hour, minute,** and **second.**

5.DM.A.1 Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real-world mathematical tasks involving:

- distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving whole numbers, decimals, and fractions.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting Content	**Previous Grade(s) Standard:** 4.DM.A.1, 4.DM.A.2 **5th Grade Standard Taught in Advance:** 5.NOF.D.14 **5th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency, Application
Foundational Skills: 2. Fluently multiply multi-digit whole numbers using a standard algorithm.		

Examples and Explanations

Students convert measurements within the same system of measurement in the context of multi-step, real-world mathematical tasks. Both customary and standard measurement systems are included; students worked with both metric and customary units of length in second grade. In third grade, students worked with metric units of mass and liquid volume. In fourth grade, students worked with both metric and customary systems and began conversions within systems in length, mass, and liquid volume.

In Grade 5, students extend their abilities from Grade 4 to express measurements in larger or smaller units within a measurement system. Students should explore how the base-ten system supports conversions within the metric system. (Example: 100 cm = 1 meter.) This is also an excellent opportunity to reinforce notions of place value for whole numbers and decimals, and connections between fractions and decimals (e.g., 2 ½ meters can be expressed as 2.5 meters or 250 centimeters). For example, Grade 5 students might complete a table of equivalent measurements in feet and inches. Grade 5 students also learn and use such conversions in solving multi-step, real-world mathematical tasks.

Examples:

- Minutes and Days
- Converting Fractions of a Unit into a Smaller Unit
- Gabbi purchased a 50-lb bag of dog food. Gabbi has three dogs that each require two 10-ounce scoops of food each day, one in the morning and another in the evening. For how many days will the 50-lb bag of dog food last?
  Sample Student Thinking:
    Bag of dog food: 50 lb x 16 oz per lb = 800 oz
    Each dog requires 20 oz of food, which means Gabbi needs 60 oz of food each day.
    800 oz ÷ 60 oz per day = $13 \frac{1}{3}$ days
    To feed all three dogs each day, the 50-lb bag will last 13 days.

[Assessment Connections](#)
Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Units and Conversion 5.DM.A.1	Converts among different-sized standard measurement units within a given measurement system and uses these conversions to solve real-world, multi-step problems.	Converts among different-sized standard measurement units within a given measurement system and uses these conversions to solve real-world, **multi-step** problems.	Converts among different-sized standard measurement units within a given measurement system **and uses these conversions to solve real-world**, one-step problems.	Converts among different-sized standard measurement units within a given measurement system and **solves one-step problems by using manipulatives or visual models.**
	Chooses the appropriate measurement unit based on the given context.			

B. Represent and interpret data. In this cluster, the terms students should learn to use with increasing precision are **line plot, length, mass,** and **liquid volume.**

5.DM.B.2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$).

- Use operations on fractions, excluding dividing fractions by fractions, to solve real-world mathematical tasks involving information presented in line plots.

Standard Overview

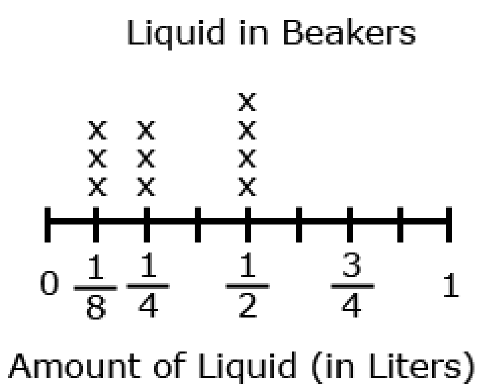
Core Tenets		
Focus	**Coherence**	**Rigor**
Supporting Content	**Previous Grade(s) Standard:** 4.DM.B.4 **5th Grade Standard Taught in Advance:** 5.NOF.A.2, 5.NOF.B.6, 5.NOF.B.7 **5th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency, Application
Foundational Skills: 4, Multiply a fraction by a whole number or a fraction.		

Examples and Explanations

Students apply their understanding of operations with fractions, excluding dividing fractions by fractions, to solve real-world mathematical tasks where information is presented in line plots. In the example below, students use either addition and/or multiplication to determine the total number of liters in the beakers. Then the sum of the liters is shared evenly among the ten beakers.

Example:

- Ten beakers, measured in liters, are filled with a liquid.



The line plot above shows the amount of liquid in liters in 10 beakers. If the liquid is redistributed equally, how much liquid would each beaker have?

Assessment Connections

Assessment Item Type(s): Type I
Evidence Statement(s): none

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Data Displays 5.DM.B.2	Makes a line plot to display a data set of measurements in fractions of a unit with denominators limited to 2, 4, and 8, uses operations on fractions to solve problems involving information in line plots, and **interprets the solution in relation to the data.**	Makes a line plot to display a data set of measurements in fractions of a unit with denominators limited to 2, 4, and **8**, and uses operations on fractions to solve problems involving information in line plots.	Makes a line plot to display a data set of measurements in fractions of a unit with denominators limited to 2 and 4, and uses operations on fractions with denominators of 2 and 4 to solve problems involving information in line plots.	Makes a line plot to display a data set of measurements in fractions of a unit with denominators limited to 2 and 4, and uses operations on fractions with denominators of 2 and 4 to solve problems involving information in line plots.

C. Understand concepts of volume and relate volume to multiplication and to addition. In this cluster, the terms students should learn to use with increasing precision are **measurement, attribute, volume, solid figure, right rectangular prism, unit, unit cube, gap, overlap, cubic units (cubic cm, cubic in., cubic ft., nonstandard cubic units), edge length, height,** and **depth**.

5.DM.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

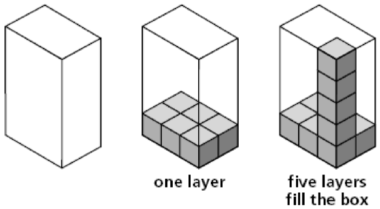
a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
b. A solid figure that can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.DM.C.4 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding (3, 3a, 3b)

Examples and Explanations

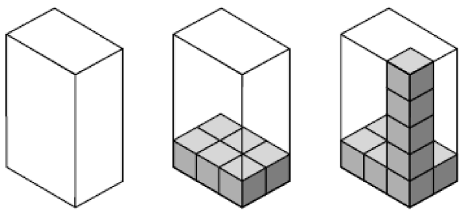
5.DM.C.3, 5.DM.C.4, and 5.DM.C.5 represent the first time that students begin exploring the concept of volume. In third grade, students began working with area and covering spaces. The concept of volume should be extended from area, with the idea that students are covering an area (the bottom of a solid figure) with a layer of unit cubes and then adding layers of unit cubes on top of the bottom layer.



Students should have ample experiences with concrete manipulatives before moving to pictorial representations. Students' prior experiences with volume were restricted to liquid volume. As students develop their understanding of volume, they understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in^3, m^3). Students connect this notation to their understanding of powers of 10 in our place value system. Models of cubic inches, centimeters, cubic feet, etc., are helpful in developing an image of a cubic unit. Students estimate how many cubic yards would be needed to fill the classroom or how many cubic centimeters would be needed to fill a pencil box.

The major emphasis for measurement in grade 5 is volume. Volume not only introduces a third dimension and thus a significant challenge to students' spatial structuring, but also complexity in the nature of the materials measured. That is, solid units are “packed,” such as cubes in a three-dimensional array, whereas a liquid “fills” three-dimensional space, taking the shape of the container. The unit structure for liquid measurement may be psychologically one-dimensional for some students.

Example:



$(3 \times 2) = 6$, representing the first layer

There are 5 layers, so $(3 \times 2) \times 5$, representing the 5 layers of 3×2

$(3 \times 2) + (3 \times 2) + (3 \times 2) + (3 \times 2) + (3 \times 2) = 6 + 6 + 6 + 6 + 6 = 5 \times 6 = 30$

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.6, LEAP.III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Recognize and Represent Volume 5.DM.C.3 5.DM.C.4	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and, **with a visual model**, understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.
	Represents the volume of a solid figure as "*n*" cubic units.	**Represents the volume of a solid figure as "*n*" cubic units.**		

5.DM.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** none **5th Grade Standard Taught in Advance:** 5.DM.C.3 **5th Grade Standard Taught Concurrently:** none	Procedural Skill and Fluency

Examples and Explanations

Students understand that same-sized cubic units are used to measure volume. They select appropriate units to measure volume. For example, they make a distinction between which units are more appropriate for measuring the volume of a gym and the volume of a box of books. They can also improvise a cubic unit using any unit as a length (e.g., the length of their pencil). Students can apply these ideas by filling containers with cubic units (concrete cubes) to find the volume. They may also use drawings or interactive computer software to simulate the same filling process (see NCTM's Cubes interactive resource as a sample).

Assessment Connections

Assessment Item Type(s): Type I, II, III
Evidence Statement(s): LEAP.II.5.6, LEAP.III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Recognize and Represent Volume 5.DM.C.3 5.DM.C.4	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.	Recognizes volume as an attribute of solid figures and, **with a visual model**, understands volume is measured using cubic units and can be found by packing a solid figure with unit cubes and counting them.
	Represents the volume of a solid figure as "*n*" cubic units.	**Represents the volume of a solid figure as "*n*" cubic units.**		

5.DM.C.5 Relate volume to the operations of multiplication and addition and solve real-world mathematical tasks involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and connect that the volume is the same as multiplying the edge lengths, also by multiplying the height by the area of the base (i.e., compute the layers of area).
   - Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world mathematical tasks.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world mathematical tasks.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 3.AR.B.5, 4.DM.A.3 **5th Grade Standard Taught in Advance:** 5.DM.C.3, 5.DM.C.4 **5th Grade Standard Taught Concurrently:** none	Conceptual Understanding (5, 5a, 5c), Procedural Skill and Fluency (5, 5a, 5b, 5c, 5d), Application (5, 5b, 5c)

Examples and Explanations

Students need multiple opportunities to measure volume by filling rectangular prisms with cubes and looking at the relationship between the total volume and the area of the base. They derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. Students use the associative property of multiplication and decomposition of numbers using factors to investigate rectangular prisms with a given number of cubic units.

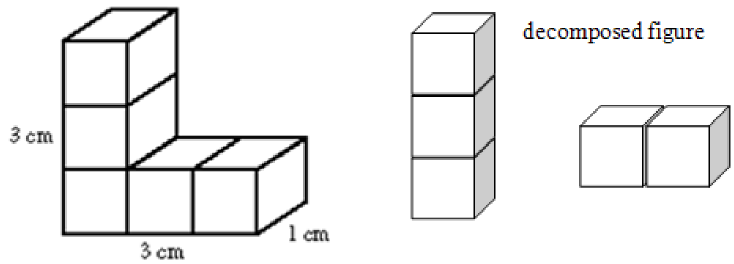
Examples:

- When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions.

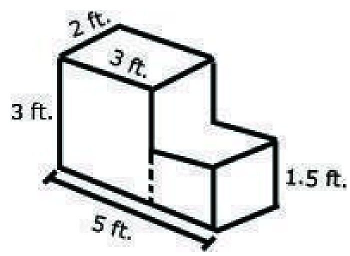
Length	Width	Height
1	2	12
2	2	6
4	2	3
8	3	1

This standard calls for students to extend their work with the area of composite figures into the context of volume. Students should be given concrete experiences of breaking apart (decomposing) 3-dimensional figures into right rectangular prisms in order to find the volume of the entire 3-dimensional figure. Formulas from part b may be used once students have an understanding of their derivation.

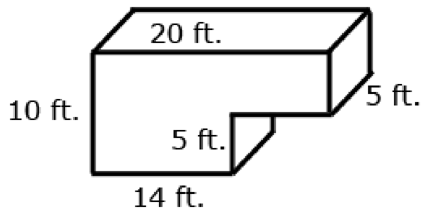
Examples:



- Students determine the volume of the concrete needed to build the steps in the diagram below.



- A homeowner is building a swimming pool and needs to calculate the volume of water needed to fill the pool. The design of the pool is shown in the illustration below.



Assessment Connections

Assessment Item Type(s): Type I, II, III

Evidence Statement(s): LEAP.II.5.2, LEAP.II.5.6, LEAP.II.5.9, LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Determine Volume 5.DM.C.5b 5.DM.C.5c	Solves real-world and mathematical problems by applying the formulas for volume, relating volume to the operations of multiplication and addition, and recognizing volume is additive by finding the volume of solid figures of two non-overlapping parts.	Solves real-world and mathematical problems by applying the formulas for volume, relating volume to the operations of multiplication and addition, and recognizing volume is additive by finding the volume of solid figures of two non-overlapping parts.	Given a visual model, solves real-world and mathematical problems **by applying the formulas** for volume, relating volume to the operations of multiplication and addition, **and recognizing volume is additive by finding the volume of solid figures of two non-overlapping parts.**	**Given a visual model and the formulas** for finding volume, solves real-world and mathematical problems by applying the formulas for volume ($V = l \times w \times h$ and $V = B \times h$).

D. Extend previous understandings of area and multiplication to multiply fractions. In this cluster, the terms students should learn to use with increasing precision are **fraction, numerator, denominator, operation, mixed number, product, partition, equal parts, equivalent, factor, unit fraction, area, side lengths, fractional side lengths,** and **comparing**.

5.DM.D.6 Apply and extend previous understandings of area and multiplication to multiply a fraction or whole number by a fraction.

a. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
c. Compose and decompose rectangular regions to calculate area.

Standard Overview

Core Tenets		
Focus	**Coherence**	**Rigor**
Major Content	**Previous Grade(s) Standard:** 4.NOF.D.11 **5th Grade Standard Taught in Advance:** none **5th Grade Standard Taught Concurrently:** 5.NOF.B.3, 5.NOF.B.6, 5.NOF.B.7	Conceptual Understanding (6, 6a, 6b, 6c), Procedural Skill and Fluency (6, 6a, 6b, 6c)
Foundational Skills: 4. Multiply a fraction by a whole number or a fraction.		

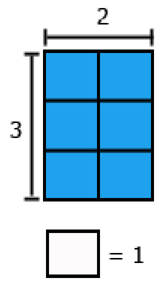
Examples and Explanations

Students are expected to multiply fractions (including proper fractions and fractions greater than one, but not mixed numbers) times a whole number. Students are also expected to multiply a fraction times a fraction because of the information found in part b. (Multiplication of mixed numbers is addressed in 5.NOF.B.6.) They multiply fractions efficiently and accurately.

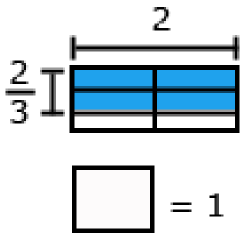
Examples:

- As students multiply fractions such as $\frac{3}{5} \times 6$, they can think of the operation in more than one way.
  $3 \times (6 \div 5)$ or $(3 \times \frac{6}{5})$
  $(3 \times 6) \div 5$ or $18 \div 5$ or $\frac{18}{5}$

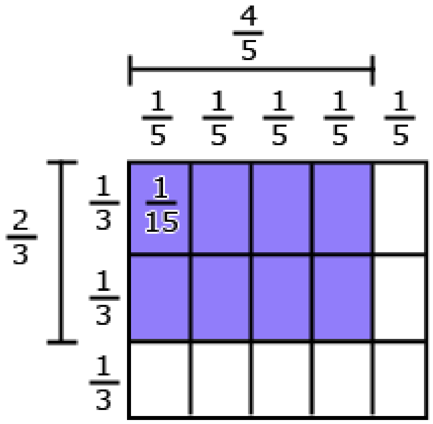
- Building on previous understandings of multiplication:
  - Rectangle with dimensions of 2 and 3 showing that 2 × 3 = 6. The area is 6 square units.



  - Rectangle with dimensions of 2 and $\frac{2}{3}$ showing that 2 × $\frac{2}{3}$ = $\frac{4}{3}$. The area is $\frac{4}{3}$ square units.



- In solving the problem $\frac{2}{3} \times \frac{4}{5}$, students use an area model to visualize it as a 2 by 4 array of small rectangles, each of which has side lengths $\frac{1}{3}$ and $\frac{1}{5}$. They reason that $\frac{1}{3} \times \frac{1}{5} = \frac{1}{(3\times5)}$ by counting squares in the entire rectangle, so the area of the shaded area is $(2 \times 4) \times \frac{1}{(3\times5)} = \frac{(2\times4)}{(3\times5)}$ or $\frac{2 \, x \, 4}{3 \, x \, 5}$.



The area model and the line segments show that the area is the same quantity as the product of the side lengths.

Assessment Connections

Assessment Item Type(s): Type I, III
Evidence Statement(s): LEAP III.5.1

Achievement Level Descriptor				
Content	**Advanced**	**Mastery**	**Basic**	**Approaching Basic**
Multiply and Divide Fractions to Solve Problems 5.DM.D.6 5.NOF.B.6 5.NOF.B.7	Solves real-world problems, by multiplying a mixed number by a fraction, a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; and interpreting the product and/or quotient.	**Solves real-world problems,** by multiplying a **mixed number by a fraction,** a fraction by a fraction and a whole number by a fraction; dividing a fraction by a whole number and a whole number by a fraction using visual fraction models and creating context for the mathematics, including rectangular areas; **and interpreting the product and/or quotient.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models **and creating context for the mathematics, including rectangular areas.**	Multiplies a fraction or a whole number by a fraction and divides a fraction by a whole number or whole number by a fraction using visual fraction models.

Cross Content Connections

Mathematics supports understanding and skills across all disciplines. The ability to apply mathematics learning across disciplines allows students to transform abstract concepts into practical tools, deepen engagement, think critically, and apply mathematics to the real world.

English Language Arts

The connection between math and English language arts (ELA) begins in disciplinary literacy, which requires literacy skills in technical subjects, including the ability to decode complex word problems as narrative structures. Students must master the language of math by using ELA skills like reading comprehension and argumentative writing to explain their reasoning, prove theorems, and articulate the logic behind their numerical solutions.

Science

K-12 math and science are deeply integrated, with mathematics serving as the essential language that allows students to quantify, model, and analyze real-world phenomena they observe in science. As students progress, they use mathematics and computational thinking,ranging from simple data graphing to complex algebraic modeling,to turn raw scientific observations into evidence-based conclusions and predictable patterns. Explicit connections between the LSSM and Louisiana Student Standards for Science (LSSS) can be found on the Connections to K-12 ELA and Math document within the LSSS files.

Computer Science

The integration of mathematics and computer science is codified through state standards that treat computational thinking as a practical application of algebraic logic and problem-solving. Students use mathematical foundations, such as functions and data analysis, to build algorithms and write code that solves real-world challenges in Louisiana's growing technology and energy sectors. The Louisiana CS Frameworks make explicit connections and embed technology tools such as artificial intelligence to support students as they engage in math and computer science learning. Students can strategically use artificial intelligence tools to explore math ideas, test conjectures, analyze patterns and trends, and refine their thinking. The appropriate and skillful use of artificial intelligence in math requires students to use their mathematical reasoning to validate and critique artificial intelligence outputs in addition to naming how the use of artificial intelligence supports and extends their thinking, understanding, and reasoning about concepts, ensuring the student maintains ownership of the mathematics, and leverages artificial intelligence as a resource.

Social Studies

The intersection of math and social studies is most evident in the analysis of historical data and economic trends, allowing students to quantify the impact of events such as the Great Flood of 1927 or the evolution of Louisiana's energy industry. By applying statistical tools to demographic shifts and geographic mapping, students move beyond historical content standards to demonstrate understanding of the skills and practices standards for social studies. Identifying and interpreting mathematical patterns strengthens students' ability to recognize trends that have shaped the geographical, economic, political, and cultural landscape of our state, nation, and world.

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Leveraging Lower Grade Standards to Support Student Learning

Grade 3 Standards

■ **3.AR.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* ■5.NOF.B.3, ■ 5.NOF.B.5, ■ 5.NOF.B.6

■ **3.AR.A.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8. Return to* ■ 5.NOF.B.3, ■ 5.NOF.B.5, ■ 5.NOF.B.6

■ **3.AR.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* ■ 5.DM.C.5

■ **3.AR.B.6** Understand division as an unknown-factor problem. Provide an explanation that leverages the relationship between multiplication and division. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8. Return to* ■ 5.NOF.B.3, ■ 5.NOF.B.7

■ **3.NOF.A.1** Understand and interpret a fraction with denominators 2, 3, 4, 6, and 8.

a. Understand a unit fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole or a set is partitioned into *b* equal parts where *b* is a non-zero whole number.
b. Understand a fraction $\frac{a}{b}$ as the quantity formed by *a* parts of size $\frac{1}{b}$.
c. Represent fractions greater than zero and less than or equal to one using concrete objects, number lines, or pictorial models.
d. Read and write fractions in standard form and written unit form.
e. Solve real-world mathematical tasks involving partitioning an object or set of objects, identifying a fraction as parts of a whole. *Return to* ■ 5.NOF.B.7

■ **3.NOF.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 $\frac{1}{b}$ 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 $\frac{1}{b}$ and that the endpoint of the part, based at 0, locates the number $\frac{1}{b}$ on the number line.
b. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off *a* lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has

size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line. *Return to* ○ 5.GL.A.1, ○ 5.GL.A.2

■ **3.DM.C.4** Recognize area as an attribute of plane figures and understand concepts of area measurement.

a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
b. A plane figure has an area of *n* square units if it can be covered entirely, without any gaps or overlaps, by n unit squares.

Return to ■ 5.DM.C.3

□ **3.GL.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).

a. 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* ○ 5.GL.B.3

Grade 4 Standards

■ **4.AR.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.
Return to ■ 5.NOF.B.3, ■ 5.NOF.B.5, ■ 5.NOF.B.6

■ **4.AR.A.2** Multiply or divide to solve real-world mathematical tasks involving multiplicative comparison.

a. Represent these tasks by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

Return to ■ 5.NOF.B.3, ■ 5.NOF.B.5, ■ 5.NOF.B.6

○ **4.AR.C.5** Generate and extend a number or shape pattern that follows a given rule.

a. Identify apparent features of the pattern that were not explicit in the rule itself. *Return to* ○ 5.AR.B.3

■ **4.NOF.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. *Return to* ■ 5.NOF.C.8

■ **4.NOF.A.2** Read and write multi-digit whole numbers up to 1,000,000 using base-ten numerals, standard form, written form, unit form, and expanded form.

a. Compare multi-digit whole numbers up to 1,000,000 using >, =, and < symbols to record the results of comparisons.
b. Order a set of whole numbers up to 1,000,000. *Return to* ■ 5.NOF.C.10

■ **4.NOF.A.3** Use place value understanding to

a. Round multi-digit whole numbers up to 1,000,000, to any place.

b. Use compatible numbers to estimate solutions to real-world mathematical tasks. *Return to* ■ 5.NOF.C.11

■ **4.NOF.D.10** Add and subtract fractions with like denominators.

a. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction greater than 1 and/or by using properties of operations and the relationship between addition and subtraction.

b. Solve real-world mathematical tasks involving addition and subtraction of fractions, including mixed numbers and fractions greater than 1, referring to the same whole and having like denominators, e.g., by using visual fraction models, number lines, or equations to represent the problem.

Return to ■ 5.NOF.D.12, ■ 5.NOF.D.13, ■ 5.NOF.D.14

■ **4.NOF.D.11** 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 $\frac{a}{b}$ as a multiple of $\frac{1}{b}$.

b. Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.

c. Solve real-world mathematical tasks involving multiplication of a fraction by a whole number, e.g., by using visual fraction models, number line diagrams, and equations to represent the problem. *Return to* ■ 5.NOF.D.12

■ **4.NOF.B.6** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value understanding, the properties of operations, and/or the relationship between multiplication and division.

a. Represent and explain the calculation by using equations, rectangular arrays, and/or area models.

Return to ■ 5.NOF.D.13

■ **4.NOF.C.7** Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{(n\,x\,a)}{(n\,x\,b)}$ by using visual fraction models or number line diagrams, 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.) *Return to* ■ 5.NOF.A.1, ■ 5.NOF.B.5

■ **4.NOF.C.8** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, and by comparing to a benchmark fraction such as $\frac{1}{2}$.

- 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 or a number line diagram. (Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100.)

Return to ■ 5.NOF.A.2

■ **4.NOF.D.9** Understand a fraction $\frac{a}{b}$ 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.

b. Decompose a fraction, including mixed numbers and fractions greater than 1, into a sum of fractions, including unit fractions and non-unit 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 or number line diagram.
c. Evaluate the reasonableness of sums and differences of fractions using benchmark fractions, 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, referring to the same whole.

Return to ■ 5.NOF.A.1

■ **4.NOF.D.11** 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 $\frac{a}{b}$ as a multiple of $\frac{1}{b}$.
b. Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number.
c. Solve real-world mathematical tasks involving multiplication of a fraction by a whole number, e.g., by using visual fraction models, number line diagrams, and equations to represent the problem.

Return to ■ 5.NOF.B.4, ■ 5.NOF.B.7

■ **4.NOF.E.12** 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. Return to* ■ 5.NOF.C.8

■ **4.NOF.E.13** Use decimal notation and precise language 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. Return to* ■ 5.NOF.C.8

■ **4.NOF.E.14** 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 or number line diagram. *Return to* ■ 5.NOF.C.8, ■ 5.NOF.C.10

□ **4.DM.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.

a. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit.
b. Record measurement equivalents in a two-column table. (Conversions are limited to one-step conversions.)

Return to □ 5.DM.A.1

□ **4.DM.A.2** Use the four operations to solve multi-step real-world mathematical tasks involving:

- distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving whole numbers and/or simple fractions, and

- problems that require expressing measurements given in a larger unit in terms of a smaller unit.

Return to ■ 5.NOF.B.3, ■ 5.NOF.B.5, ■ 5.NOF.B.6, ◘ 5.DM.A.1

◘ **4.DM.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.*
Return to ■ 5.DM.C.5

◘ **4.DM.B.4**Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$).

a. Solve real-world mathematical tasks involving the addition and subtraction of fractions with like denominators by using information presented in line plots.

Return to ◘ 5.DM.B.2

○ **4.GL.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.

a. Recognize right triangles as a category, and identify right triangles.

Return to ○ 5.GL.B.3