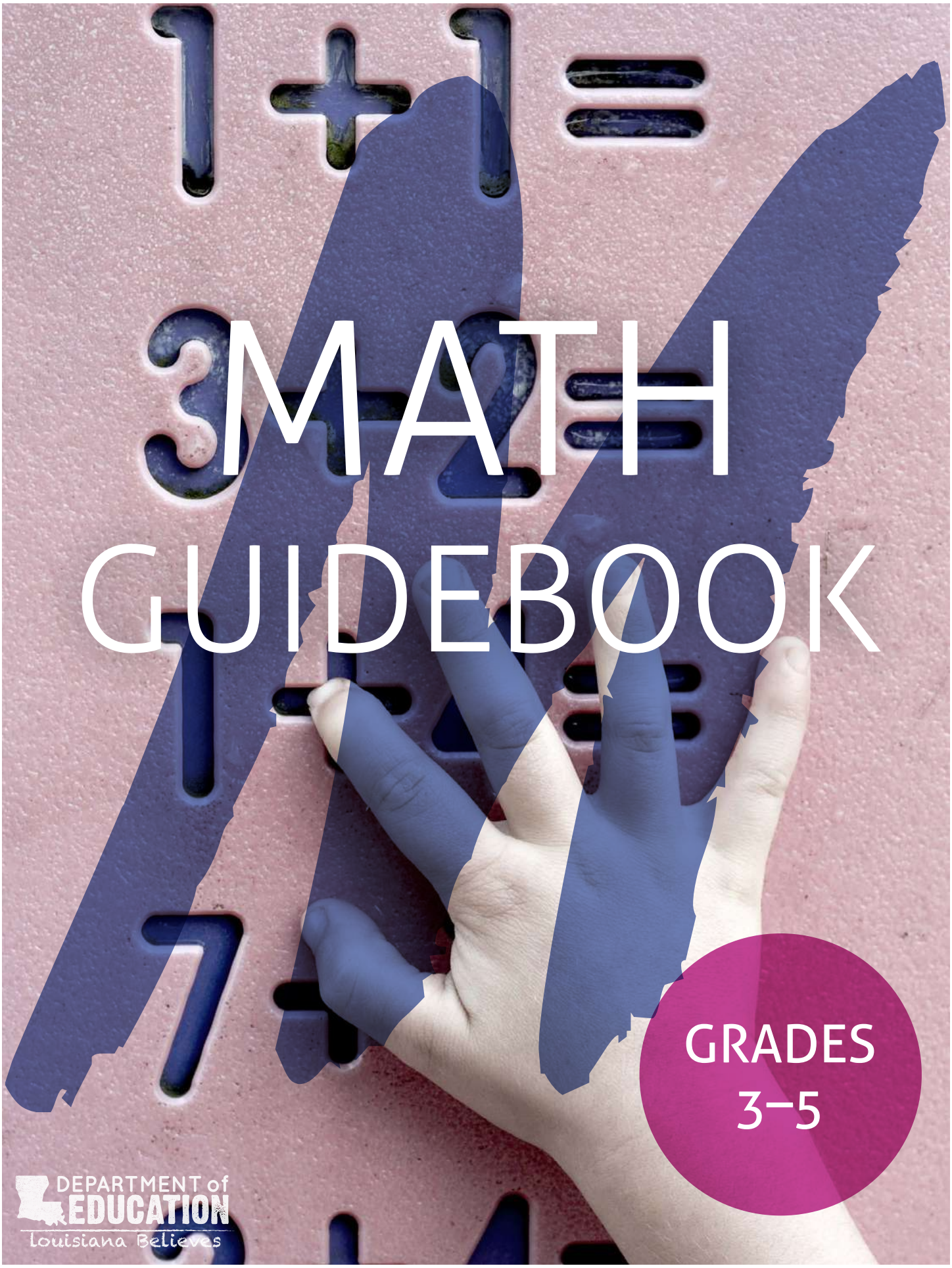


MATH GUIDEBOOK

GRADES 3–5

DEPARTMENT of EDUCATION
Louisiana Believes

CONTENTS

This public document was published at a cost of $5,772.67. Five hundred (500) copies of this public document were published at this first printing at a cost of $5,772.67. The total cost of all printings of this document, including all reprints, was $5,772.67. This document was printed by the Office of Content; Louisiana Department of Education; P.O. Box 94064, Baton Rouge, LA 70804-9064. This material was printed in accordance with the standards for printing by State agencies established pursuant to R.S. 43.31.

Louisiana Believes...

Louisiana students...are **just as capable as students anywhere. They deserve high expectations** with support to reach them so that they are prepared to complete college and attain a professional career.

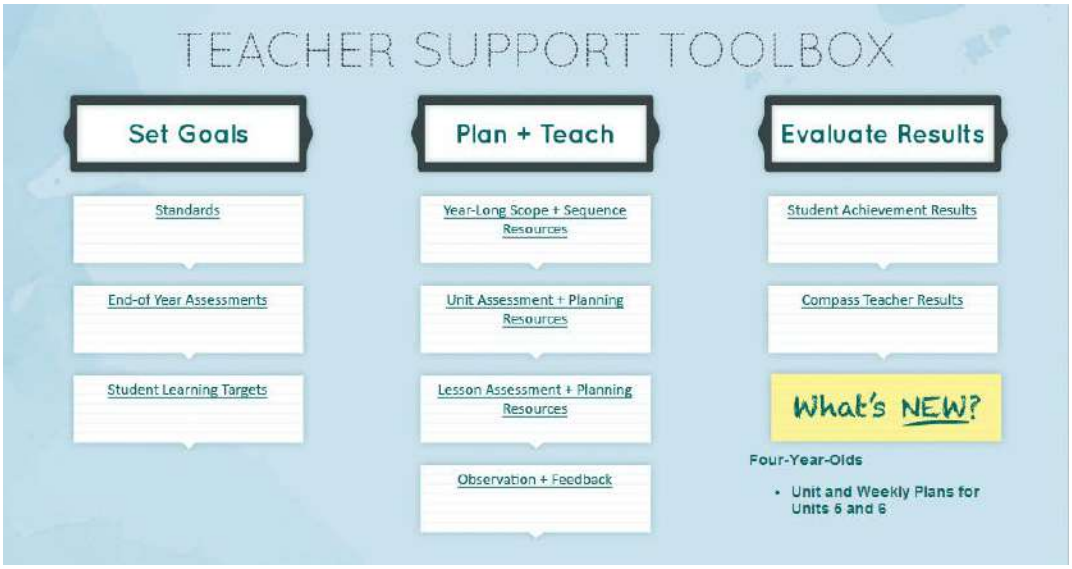
Louisiana teachers...will understand those expectations and work with their peers to make individual decisions to **meet their students' needs through planning and instruction.**

Louisiana principals and schools...will **create and lead meaningful structures of feedback and collaboration** to ensure teachers are able to learn and grow with support and guidance.

Louisiana districts...will **choose strong assessment and curricular** plans and **build systems that support school leaders** with goal setting, feedback, and collaboration.

Louisiana's Department of Education...will continue to shift away from prescribing local decisions and instead **provide resources, data, models, and direct teacher, principal, and district support.**

At the heart of these beliefs is good classroom teaching and learning. Effective instruction stems from the constant cycle of setting an ambitious goal, planning and teaching, and evaluating results. Our Teacher Support Toolbox in Louisiana is built to support these core actions of teachers. This instructional guidebook is a printed companion to our Teacher Support Toolbox. The guidebooks and the Teacher Support Toolbox, when used together, should support teachers and schools to make informed but independent decisions about how to provide rigorous but unique instruction in each classroom around the state.



http://www.louisianabelieves.com/resources/classroom-support-toolbox/teacher-support-toolbox

How to Use the Math Guidebook

This guide is meant to support teachers in supplementing math instruction for students. Each group of students has a unique set of needs thus, the department is not mandating that teachers use the instructional tools shared in this guide. Instead, the models are provided as a starting point for teams of teachers to use in planning for the unique needs of their students.

This guide provides:

- An explanation of strong math instruction
- Grade-level and standard specific remediation guidance
- Instructional tasks aligned to the state standards for math

This guide **does not** provide:

- A complete curriculum
- A set of plans that should be taught exactly the same in every classroom
- Daily lesson plans that all math teachers must use in their classroom

How to Read the Math Guidebook

There are two sections of this guide, which function differently.

- ***Mathematics Overview*** (page 8): This section describes how teachers approach the shifts called for in Louisiana's new math standards.
- ***Tools for Teaching*** (page 13): This section provides grade-level instructional tasks and remediation guidance. These tasks are meant to serve as a supplement to a curriculum already in use in a classroom. Teachers should collaborate to adjust these tasks to meet the needs of their students.

In addition, this guide is a companion to additional resources within the Teacher Support Toolbox.[1] Thus, throughout the guide you will see the following icons that highlight key connections.

Online Teacher Toolbox Resources: Notes a recommendation to find more available resources in the Teacher Support Toolbox.

Multimedia Components: Notes a recommendation to find a resource or video hosted on an outside Internet site.

Statewide Assessment: Illustrates how a component of this guide connects to the statewide assessment students will take.

Compass Connections: Illustrates the connections between instructional content and the Compass rubric.

As always, we welcome questions and feedback on these materials. If you need any support, do not hesitate to reach us at classroomsupporttoolbox@la.gov.

[1] http://www.louisianabelieves.com/resources/classroom-support-toolbox/teacher-support-toolbox

MATH OVERVIEW

MATHEMATICS OVERVIEW

STANDARDS SHIFTS

Louisiana's math standards (see "APPENDIX" on page 231) help students practice and master rigorous mathematical concepts. These new standards require students to answer complex math questions correctly and also to explain their thinking on how they arrived at the answer. Because these new standards ask students to go deeper in their exploration of math content, teachers will need to shift how they plan lessons and deliver instruction.

These major shifts include:

Shift 1: Focus strongly where the standards focus.

Definition of this shift: The standards call for a greater focus in mathematics. Rather than racing to cover topics in a mile-wide, inch-deep curriculum, the standards require teachers to significantly narrow the concepts covered in a single year and deepen student understanding of those concepts. The standards focus on the major work of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the math classroom. The major work of each grade includes:

- K-2: Addition and subtraction—concepts, skills, and problem solving; place value
- 3-5: Multiplication and division of whole numbers and fractions—concepts, skills, and problem solving
- 6: Ratios and proportional relationships; early expressions and equations
- 7: Ratios and proportional relationships; arithmetic of rational numbers
- 8: Linear algebra and linear functions

Shift 2: Coherence: Think across grades, and link to major topics within grades.

Definition of this shift: The standards progress from grade to grade in a coherent way. Learning is carefully connected across grades so that students can build new understanding onto foundations built in previous years. Each standard is not a new concept, but an extension of previous learning.

Illustration of this shift: The standards are written to connect between grade levels and within a grade level. The first illustration on page 9 shows a sample mathematical concept and how it is scaffolded from 3rd grade to middle school. The second illustration shows how standards connect to each other within one grade level.

One of the several staircases to Algebra.

6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers

5.NF.A Use equivalent fractions as a strategy to add and subtract fractions

4.NF.A Extend understanding of fraction equivalence and ordering

3.NF.A Develop understanding of fractions as numbers

Example: Geometric Measurement: Understand Concepts of Volume

Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

Standard 5.MD.C.5

Shift 3: Rigor: In major topics, pursue conceptual understanding, procedural skill and fluency, and application with equal intensity.

Definition of this shift:

- ***Conceptual understanding***: The standards call for conceptual understanding of key concepts. Conceptual understanding helps students to explain how they got the correct answers and allows them to apply what they have learned to new types of problems.
- ***Procedural skill and fluency***: The standards call for speed and accuracy in calculation. Students are given opportunities to practice core functions, such as single-digit multiplication, so that they have access to more complex concepts and procedures.
- ***Application***: The standards call for students to use math flexibly for applications in problem-solving contexts. In content areas outside of math, particularly science, students are given the opportunity to use math to make meaning of and access content.

Illustration from the Unit Plans: See the next section, Rigor, for an illustration of this shift.

To find your grade-level standards, go to the "APPENDIX" on page 231 of this document.

To find learning modules to help you better understand the standards, go to the standards page[2] in the Teacher Support Toolbox.

The new math standards are well researched.[3] Do not miss out on reviewing the research behind this approach to math instruction.

[2] http://www.louisianabelieves.com/resources/classroom-support-toolbox/teacher-support-toolbox/standards

[3] http://www.achievethecore.org/dashboard/2/search/6/2/0/1/2/3/4/5/6/7/8/9/10/11/12/page/407/mathematics-research-and-articles

ASSESSMENT AND INSTRUCTION

Instructionally, the most challenging shift comes with the focus on rigor. Rigor in a math classroom can be extremely difficult to nail down. So often, educators are tempted to practice procedures with students rather than help them master the mathematical concepts. This shift from simply practicing and assessing procedures with students to practicing and assessing concepts is challenging, but critical. Even more, with the increased expectations brought on with the shift in rigor, remediation becomes critical. Teachers must work to identify which students need remediation and on which standards remediation would be most beneficial for these students. Thus, rigor and the needed remediation associated with increased rigor are two of the most important shifts teachers must be aware of as they change their instruction and assessment.

Rigor

While student fluency with math skills is critical, even more important is a student's ability to show mastery of a mathematical concept. State assessments will no longer demand that students simply perform based on memorized basic procedures. Rather, just as in real life, students are asked to solve complex problems based on their mathematical understanding.

So what does this really mean? Let's take a sample standard and consider what it would look like to teach and assess the procedure versus the concept.

Standard: **4.NF.A**: Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. 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.

- The following is an item that would be used to teach and assess the procedure:
  - » True or False? If your answer is false, explain.
    $\frac{3}{2} < \frac{5}{6}$

- The following is an item that would be used to teach and assess the concept:
  - » You are comparing the fractions $\frac{3}{2}$ and $\frac{5}{6}$.
    1. Graph each fraction on the provided number line.

    2. Is $\frac{3}{2}$ greater than or less than $\frac{5}{6}$? Explain how you know.
    3. Write a fraction that is between $\frac{3}{2}$ and $\frac{5}{6}$. Explain how you know your fraction is between $\frac{3}{2}$ and $\frac{5}{6}$.

Item adapted from: http://www.parcconline.org/sites/parcc/files/Grade4-FractionComparison.pdf

In both examples, students need to know the steps and procedures to actually solve the equation. But in the second, memorizing the procedure alone is not enough. For students to apply mathematical understanding in the future, in a variety of settings, they must know why they are using the procedures and how to adapt them to fit new settings.

The tasks included in this guidebook deliberately help students explore, practice, and show mastery of the mathematical concepts demanded in the standards. This includes students' fluent use of basic math skills but pushes them beyond simple memorization to deep understanding of the content.

Remediation

As the rigor increases for students, so do the potential gaps in their understanding. Often, the instinct is to say that if a student is not at grade level, a teacher must completely go back to previous grade levels and remediate everything before moving on. In math, like other content areas, students do need quality remediation. But that remediation must be focused just on the content needed to quickly get students to practice at grade level. By practicing content at grade level, students more quickly improve their skill and understanding.

Let's look at an example.
Let's say that 4th Grade students are working on standard **4.OA.A.2**: Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

If the students are struggling in 4th Grade with this standard, there are a few isolated standards from previous grade levels and from within 4th grade that will prepare students for this standard.

Standards from previous grades that prepare students include:

- **3.OA.A.3**: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Standards from 4th Grade that should be taught in advance of the above standard include:

- **4.OA.A.1**: Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Standards from 4th Grade that should be taught at the same time as the above standard include:

- **4.MD.A.1**: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

The writers of the math standards created a tool[4] to help teachers more quickly determine the required previous content needed for each individual standard. This guide has taken that tool and created easy-to-access charts for teachers by grade level (in the "Tools for Teaching" section that follows). These charts will help teachers more quickly identify just the necessary remediation. This will allow students faster access to grade-level content, allowing them to grow and also practice basic skills in a more authentic setting.

Every task included in this guide includes the recommended remedial standards along with sample tasks to check on student readiness for the grade-level task. Below is an example of a chart included in every task included in this guide. The links provide sample practice problems to help teachers remediate with students in preparation for grade-level task.

Grade-Level Standard	The Following Standards Will Prepare Students:	Items to Check for Task Readiness:	Sample Remediation Items:
4.OA.A.2	• 3.OA.A3	1. Sarah raised $74 for the food bank last year. She raised 3 times as much money this year. How much money did she raise this year? a. $222 2. A rubber band is stretched to 12cm. It is 4 times as long as its original length. How many centimeters long is its original length? a. 3 cm 3. http://www.illustrativemathematics.org/illustrations/263	http://www.illustrativemathematics.org/illustrations/365 http://learnzillion.com/lessonsets/615-solve-word-problems-using-multiplicative-comparisons

[4] http://www.edutron.com/0/Math/ccssmgraph.htm

TOOLS FOR TEACHING

3RD GRADE TOOLS

3RD GRADE TOOLS

3rd Grade Remediation Guide

As noted in "Remediation" on page 12 isolated remediation helps target the skills students need to more quickly access and practice on-grade level content. This chart is a reference guide for teachers to help them more quickly identify the specific remedial standards necessary for every Algebra I math standard[5].

3rd Grade Standard	Previous Grade Standards	3rd Gr. Standards Taught in Advance	3rd Gr. Standards Taught Concurrently
3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7.	• 2.OA.C.3 • 2.OA.C.4		• 3.OA.B.6
3.OA.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.*		• 3.OA.A.1	• 3.OA.B.6
3.OA.A.3 ***(no measurement)*** Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.1		• 3.OA.A.1 • 3.OA.A.2	• 3.OA.A.4 • 3.OA.B.6
3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.1		• 3.OA.A.3 *(no measurement)*	• 3.OA.A.4
3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?*			• 3.OA.A.3 *(no measurement)* • 3.OA.A.3 • 3.OA.C.7
3.OA.B.5 Apply properties of operations as strategies to multiply and divide.2 *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*		• 3.OA.A.1 • 3.OA.A.2	• 3.MD.C.7c

[5] This content comes from the work of the math standards' authors found here: http://www.edutron.com/0/Math/ccssmgraph.htm

3rd Grade Standard	Previous Grade Standards	3rd Gr. Standards Taught in Advance	3rd Gr. Standards Taught Concurrently
3.OA.B.6 Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*			• 3.OA.A.1 • 3.OA.A.2 • 3.OA.A.3 *(no measurement)*
3.OA.C.7 ***(no memory)*** Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.		• 3.OA.B.5 • 3.OA.B.6	• 3.OA.A.4 • 3.OA.D.8 *(no judging reasonableness)*
3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.		• 3.OA.C.7 *(no memory)*	• 3.OA.D.8
3.OA.D.8 ***(no judging reasonableness)*** Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.[3]	• 2.OA.A.1 *(two-step and harder one step)*	• 3.OA.A.3	• 3.OA.C.7 *(no memory)*
3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.[3]		• 3.OA.A.3 • 3.OA.D.8 *(no judging reasonableness)*	• 3.OA.C.7 • 3.MD.A.2 • 3.MD.B.3 • 3.MD.C.7d • 3.MD.D.8
3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*	• 2.OA.C.3	• 3.OA.B.5	
3.NBT.A.1 Use place value understanding to round whole numbers to the nearest 10 or 100.	• 2.NBT.A.1		
3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	• 2.NBT.B.7 *(no concrete or drawings)* • 2.NBT.B.8		
3.NBT.A.3 Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.	• 2.NBT.A.1	• 3.OA.B.5	

3rd Grade Standard	Previous Grade Standards	3rd Gr. Standards Taught in Advance	3rd Gr. Standards Taught Concurrently
3.NF.A.1 Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by *a* parts of size 1/*b*.	• 2.MD.A.2 • 2.G.A.3		• 3.NF.A.2 • 3.MD.A.2 *(measure, estimate only)* • 3.MD.B.4
3.NF.A.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. b. Represent a fraction *a/b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line.	• 2.MD.B.6		• 3.NF.A.1 • 3.MD.B.4
3.NF.A.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b. Recognize and generate simple equivalent fractions, e.g., ½ = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model. c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.* d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.		• 3.NF.A.1 • 3.NF.A.2	
3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.	• 2.MD.B.6 • 2.MD.C.7		
3.MD.A.2 ***(measure, estimate only)*** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).1 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.[2]	• 2.MD.A.1		• 3.NF.A.1

3rd Grade Standard	Previous Grade Standards	3rd Gr. Standards Taught in Advance	3rd Gr. Standards Taught Concurrently
3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).[1] Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.[2]		• 3.MD.A.2 *(measure, estimate only)*	• 3.OA.D.8
3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*			• 3.OA.D.8
3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.			• 3.NF.A.1 • 3.NF.A.2
3.MD.C.5 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 which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.	• 1.G.A.2 • 2.MD.A.1		
3.MD.C.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	• 2.G.A.2	• 3.MD.C.5	
3.MD.C.7a Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.		• 3.MD.C.6	
3.MD.C.7b Relate area to the operations of multiplication and addition. b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.		• 3.MD.C.7a	
3.MD.C.7c Relate area to the operations of multiplication and addition. c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.		• 3.MD.C.7a • 3.MD.C.7b	• 3.OA.B.5

3rd Grade Standard	Previous Grade Standards	3rd Gr. Standards Taught in Advance	3rd Gr. Standards Taught Concurrently
3.MD.C.7d Relate area to the operations of multiplication and addition. d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.		• 3.MD.C.5 • 3.MD.C.7c	• 3.OA.D.8
3.MD.D.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.		• 3.MD.C.5	• 3.OA.D.8
3.G.A.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	• 2.G.A.1		
3.G.A.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*		• 3.NF.A.1	

3rd Grade Tasks At a Glance

There are 10 sample tasks included in this guidebook that can be used to supplement any curriculum.

The tasks for third grade include:

- **5 Extended Constructed Response (ECR):** These short tasks, aligned to the standards, mirror the extended constructed response items students will see on their end of year state assessments.
- **5 Instructional Tasks (IT):** These complex tasks are meant to be used for instruction and assessment. They will likely take multiple days for students to complete. They can be used to help students explore and master the full level of rigor demanded by the standards. Teachers can use the table below to find standards associated with current instruction and add in these practice items to supplement any curriculum. These tasks should be used after students have some initial understanding of the standard. They will help students solidify and deepen their understanding of the associated content.

This is an overview of the third grade tasks included on the following pages.

Title	Type	Task Standards	Task Remedial Standards
Mia and Jon's Table Page 24	ECR	• 3.MD.C.7a • 3.MD.C.7c	• 3.MD.C.6 • 3.MD.C.7b
Mrs. Jones's Classroom Page 28	ECR	• 3.MD.C 6	• 2.G.A.2
Kim's Candy Bar Page 34	ECR	• 3.NF.A.1 • 3.NF.A.2	• 2.MD.A.2 • 2.G.A.3 • 2.MD.B.6
Planting Flowers Page 38	ECR	• 3.OA.A.1 • 3.OA.A.3 • 3.OA.C.7	• 2.OA.C.3 • 2.OA.C.4 • 3.OA.B.5 • 3.OA.B.6
Going to the Fair Page 44	ECR	• 3.OA.A.3 • 3.OA.A.4 • 3.OA.B.5 • 3.OA.C.7 • 3.OA.D.8	• 2.OA.A.1 • 3.OA.A.1 • 3.OA.A.2 • 3.OA.B.6
Time Intervals Page 55	IT	• 3.MD.A.1	• 2.MD.B.6 • 2.MD.C.7
Harry's Day Page 61	IT	• 3.OA.A.1 • 3.OA.A.3	• 2.OA.C.3 • 2.OA.C.4 • 3.OA.A.2
Arianna's Birthday Party Page 68	IT	• 3.OA.A.3 • 3.OA.B.6 • 3.OA.D.8	• 2.OA.A.1 • 3.OA.A.1 • 3.OA.A.2
Bobby's Field Day Page 74	IT	• 3.OA.A.2	• 3.OA.A.1
Five Sisters Running a Race Page 80	IT	• 3.NF.A.2 • 3.NF.A.3	• 2.MD.B.6 • 3.NF.A.1

Mia and Jon's Table (ECR)

Overview

The student will demonstrate the ability to find area using multiplication and tiling on a given rectangle.

Standards

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

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

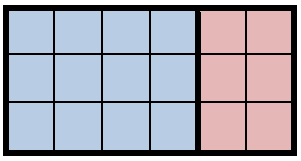
a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that area is the same as would be found by multiplying the side lengths.

c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b* + *c* is the sum of *a* x *b* and *a* x *c*. Use area models to represent the distributive property in mathematical reasoning.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.MD.C.7a	• 3.MD.C.6	1. The rectangle below has a length of 8 cm and a width of 5 cm. The rectangle will be tiled with tiles that are 1 cm square each. How many tiles would be needed to find the area of the rectangle?  5 cm 8 cm a. 40 square cm tiles 2. What operation could be used to find the area of the rectangle below?  3 in 5 in a. Multiplication	• http://learnzillion.com/lessonsets/581-relate-area-to-multiplication-and-addition-using-unit-squares-and-arrays • http://learnzillion.com/lessonsets/378-relate-area-to-multiplication-and-addition-using-arrays-

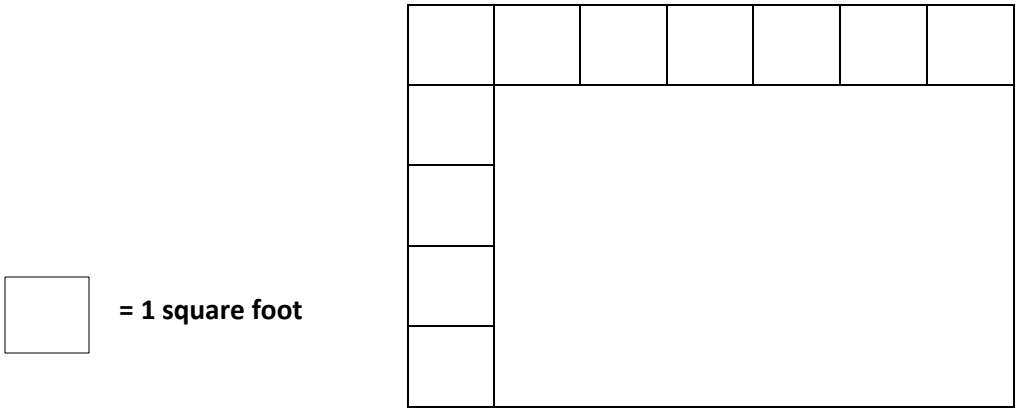
3.MD.C.7c	• 3.MD.C.7b	1. Use an area model with colored tiles to show that the area of a rectangle with a length of 6 units and a width of 3 units can be found by adding the products $(3 \times 2) + (3 \times 4)$. a.  The blue tiles show that 3 x 4 is 12 square units. The red tiles show that 3 x 2 is 6 square units. Together 3 x 6 is 18 square units.	• http://learnzillion.com/lessonsets/758-use-tiling-to-represent-distributive-property • http://learnzillion.com/lessonsets/725-use-tiling-and-area-models-to-represent-the-distributive-property

After the Task:

Students may struggle with part 3 in the task. Ask students to state different pairs of numbers with a sum of 7. Then have students divide the length of the given rectangle to show those different sums. Have students use colored tiles to find the area of the two smaller rectangles and relate that area to the corresponding multiplication facts.

Student Extended Constructed Response

Mia and Jon are trying to find the area of their dining room table below using tiles.



= 1 square foot

1. What is the area of the dining room table in square feet? Draw tiles to complete filling in the area of the rectangle above to prove that your answer is correct.

2. Mia multiplies 5 x 6 to find the area while Jon multiplies 5 x 7 to find the area. Which sibling, Mia or Jon, used the correct expression to find the area? Explain your reasoning.

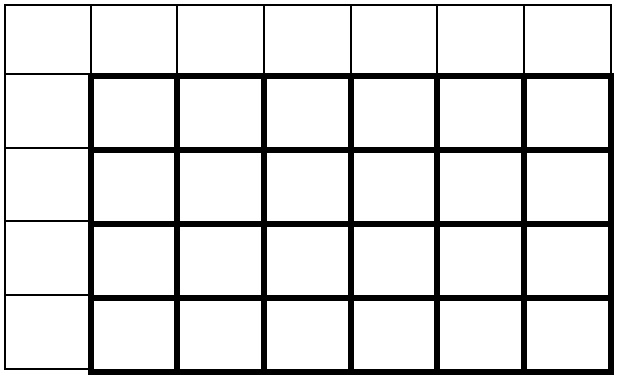
3. Show another way Jon and Mia could have found the area of the dining room table using multiplication and addition. Explain your thinking and use a drawing to support your explanation.

Adapted from http://3-5cctask.ncdpi.wikispaces.net/3.MD.5-3.MD.7 3.MD.7 task 2

Extended Constructed Response Exemplar Response

Mia and Jon are trying to find the area of their dining room table below using tiles.

= 1 square foot



Student should add 24 "tiles" to complete the area for a total of 35 "tiles"

1. What is the area of the dining room table in square feet? Draw tiles to complete filling in the area of the rectangle above to show how you know your answer is correct.

   The area of the dining room table is 35 square feet.

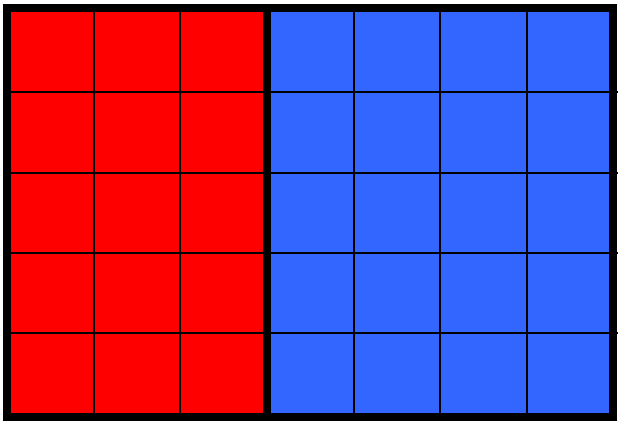
2. Mia multiplies 5 x 6 to find the area while Jon multiplies 5 x 7 to find the area. Which sibling, Mia or Jon, used the correct expression to find the area? Explain your reasoning.

   Jon is correct because he multiplied 5 x 7. The length of the rectangle is 7 feet and the width is 5 feet. To find the area you can multiply 5 x 7, which totals 35 square feet.

3. Show another way Jon and Mia could have found the area of the dining room table using multiplication and addition. Explain your thinking and use a drawing to support your explanation.

   Students could use various multiplication expressions to add together to find the area.

   Sample response: Jon and Mia could divide the rectangle into smaller rectangles. The model below shows the length of 7 as 3 + 4. Then, we could multiply 3 x 5 = 15 to find the area of the rectangle in red and 4 x 5 = 20 to find the area of the rectangle in blue. Finally, add 15 + 20 to find the total area of 35 square units.



Mrs. Jones's Classroom (ECR)

Overview

Students will find the area of different figures by counting square units.

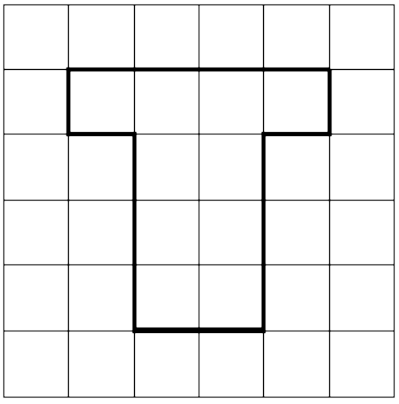
Standards:

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

3.MD.C.6 Measures areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.MD.C6	• 2.G.A.2	1. What is the area of the figure below?  a. 10 square units 2. http://www.illustrativemathematics.org/illustrations/1515	• http://learnzillion.com/lessonsets/113-measure-area-by-counting-unit-squares

Real-world preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is an arrangement?** An arrangement places things in a particular way. For example, desks in a classroom can be arranged in rows and columns like an array, or they might be arranged in groups, with the groups spread throughout the classroom.
- **What is a floor plan?** A floor plan is a plan of a room or floor of a building drawn to scale as if viewed from above.

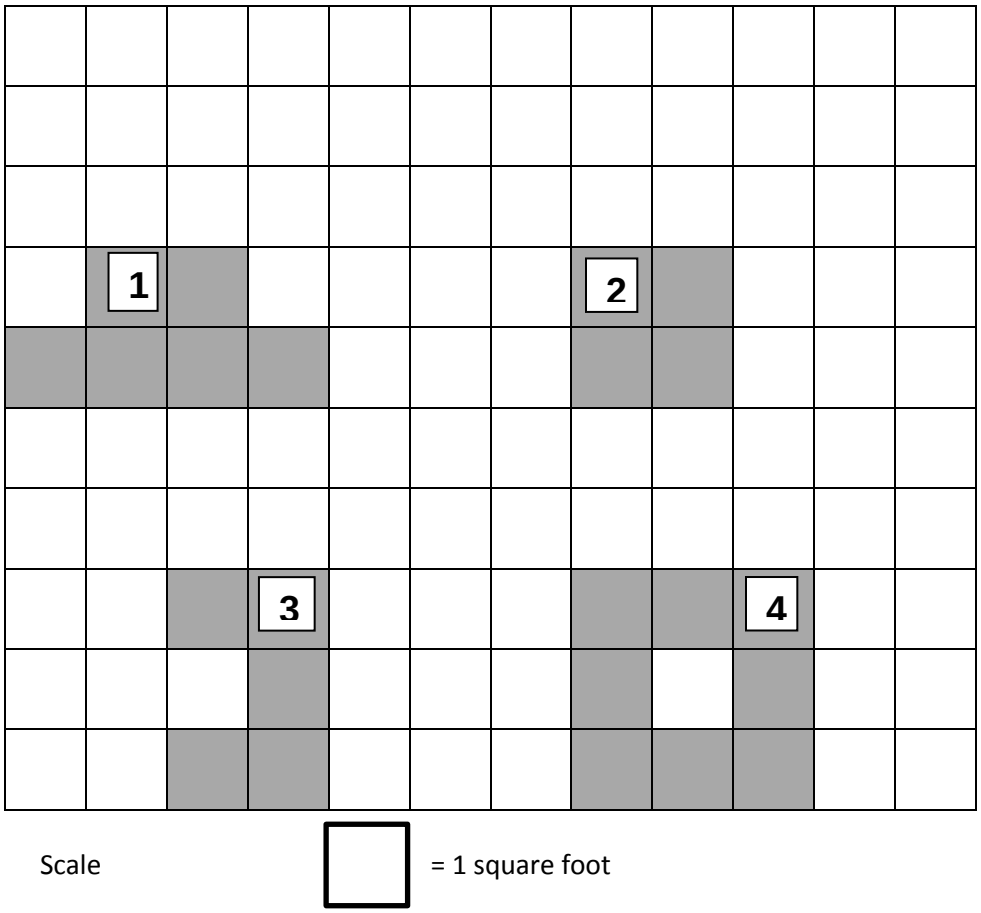
After the Task:

Students may struggle with number 5 of the task. In this case, provide students with a set number of manipulatives and have them create various shapes using all the manipulatives. Next, have them draw the shapes on grid paper. (Sample manipulatives that can be used are Cheez-It® crackers, Starburst® candies, or colored tiles.)

This task will show how area appears in the real world. Have students brainstorm various real-world scenarios in which area would be used (e.g. tiling a floor, covering floor space with a bed or furniture, window panes). Also, have students do a visual search of area-related items in the class (e.g. desktop, window panes, cabinets, ceiling tiles).

Student Extended Constructed Response

Mrs. Jones is trying to find the best way to arrange her students' desks into groups. Below is a floor plan of her classroom showing different arrangements for the groups. Each shaded square represents the placement of one desk.



1. Which of Mrs. Jones's groups has the least area?

2. What is the total area in square feet for group 3?

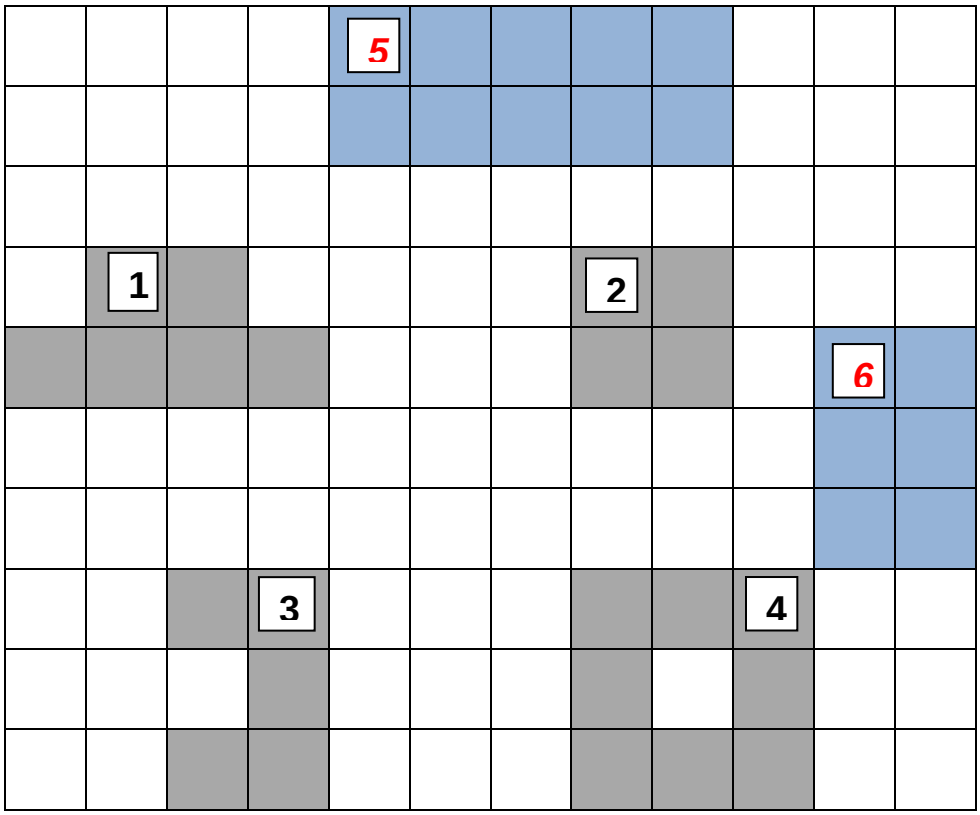
3. William, one of Mrs. Jones's students, looked at the floor plan and said that group 4's desks cover the largest area. Do you agree with William? Explain your thinking.

4. On the floor plan provided above, draw group 5 for Mrs. Jones's class so that it has an area of 10 square feet.

5. On the floor plan provided above, draw group 6 so that it has the same area as group 1 but is arranged in a different way.

Extended Constructed Response Exemplar Response

Mrs. Jones is trying to find the best way to arrange her students' desks into groups. Below is a floor plan of her classroom showing different arrangements for the groups.



Scale = 1 square foot

1. Which of Mrs. Jones's groups has the least area?

   Group 2

2. What is the total area in square feet for group 3?

   5 square feet (students do not need to include the units)

3. William, one of Mrs. Jones's students, looked at the floor plan and said that group 4's desks cover the largest area. Do you agree with William? Explain your thinking.

   William is correct because group 4 has an area of 8 square units. Group 4 covers more area than groups 1, 2, and 3.

4. On the floor plan provided above, draw group 5 for Mrs. Jones's class so that it has an area of 10 square feet.

   See the squares shaded in blue on the grid above. Students may have different arrangements; they must have the correct number of squares in the group they drew.

5. On the floor plan provided above, draw group 6 so that it has the same area as group 1 but is arranged in a different way.

   See the squares shaded in blue on the grid above. Students may have different arrangements; they must have the correct number of squares in the group they drew.

Kim's Candy Bar (ECR)

Overview

This task requires students to understand that a fraction is a part of a whole, to show equal fractions on a number line, and to explain their reasoning.

Standards:

Develop understanding of fractions as numbers.

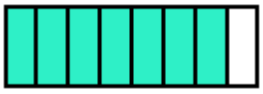
3.NF.A.1 Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.

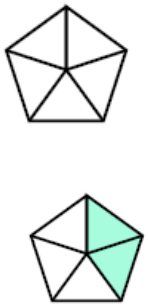
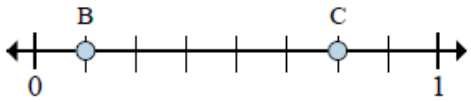
3.NF.A.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the end point of the part based at 0 locates the number 1/*b* on the number line.
b. Represent a fraction *a*/*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its end point locates the number *a*/*b* on the number line.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.NF.A.1	• 2.MD.A.2 • 2.G.A.3	1. Write a fraction that represents the shaded portion of the rectangle below.  a. $\frac{7}{8}$ 2. Shade the figure below to represent the	• http://www.illustrativemathematics.org/illustrations/827 • http://www.illustrativemathematics.org/illustrations/826 • http://learnzillion.com/lessonsets/89-understand-a-fraction-1b-as-part-of-a-whole-partitioned-into-b-equal-parts • http://learnzillion.com/lessonsets/79-understand-fractions

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		fraction $\frac{2}{5}$.  a. 3. http://www.illustrativemathematics.org/illustrations/833	
3.NF.A.2	• 2.MD.B.6	Use the number line below to answer the two questions.  1. What is the location of B written as a fraction? a. $\frac{1}{8}$ 2. What is the location of C written as a fraction? a. $\frac{6}{8}$ 3. http://www.illustrativemathematics.org/illustrations/168 4. http://www.illustrativemathematics.org/illustrations/1350	• http://www.illustrativemathematics.org/illustrations/1081 • http://learnzillion.com/lessonsets/334-represent-fractions-on-a-number-line • http://learnzillion.com/lessonsets/80-fractions-on-number-lines

After the Task:

If a student struggles with identifying fractions as parts of a whole, provide him or her with manipulatives to use in dividing wholes into equal parts and identifying parts of a whole as well as total pieces needed to make a whole. (Possible manipulatives could include an actual candy bar, a picture of a candy bar that they can cut and label, graham crackers that can be broken into equal pieces, or pictures of pizzas, pies, etc.)

Student Extended Constructed Response

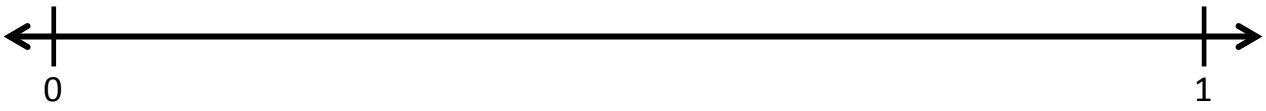
Kim wants to share a candy bar between herself and 5 of her friends after cheerleading practice.

1. Use the rectangle below to show how Kim could divide her candy bar so that each person gets an equal share.

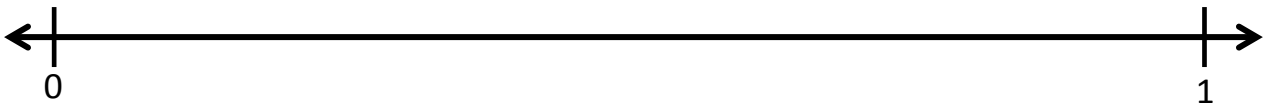
2. Write a fraction that would represent one piece of the candy bar.

3. Explain what the fraction $\frac{5}{6}$ means in terms of the candy bar.

4. Two friends were not at practice so Kim only shared $\frac{4}{6}$ of her candy bar. Show where $\frac{4}{6}$ would be located on the number line below.



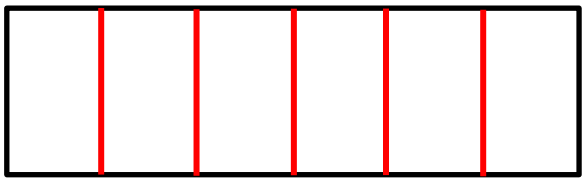
5. The next day Kim brought another candy bar and only shared it with 2 friends. Kim and her two friends each got an equal share. Show what fraction of the candy bar Kim kept for herself using the number line below.



Extended Constructed Response Exemplar Response

Kim wants to share a candy bar between herself and 5 of her friends after cheerleading practice.

1. Use the rectangle below to show how Kim could divide her candy bar so that each person gets an equal share.



2. Write a fraction that would represent one piece of the candy bar.

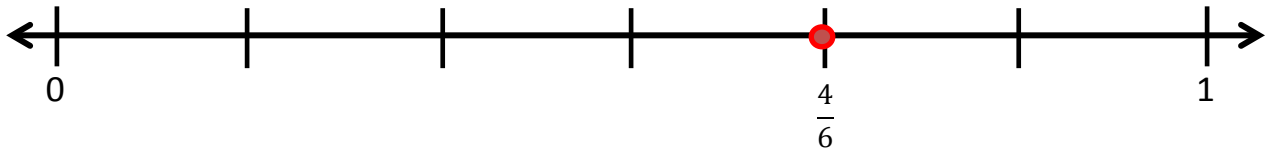
$$\frac{1}{6}$$

3. Explain what the fraction $\frac{5}{6}$ means in terms of the candy bar.

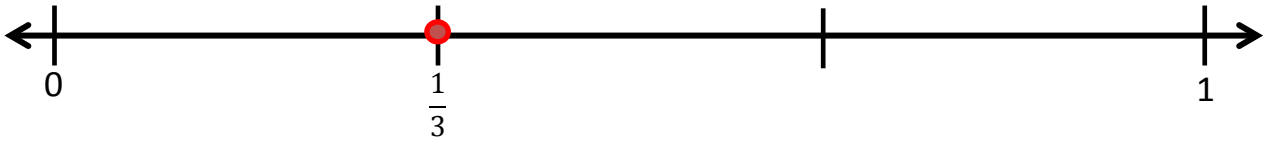
   The fraction $\frac{5}{6}$ means that there are 5 of the pieces that are $\frac{1}{6}$ of the candy bar.

   Also accept: $\frac{5}{6}$ means there are 5 of the 6 pieces of the candy bar; or $\frac{5}{6}$ is the portion of the candy bar Kim plans to share.

4. Two friends were not at practice so Kim only shared $\frac{4}{6}$ of her candy bar. Show where $\frac{4}{6}$ would be located on the number line below.



5. The next day Kim brought another candy bar and only shared it with 2 friends. Kim and her two friends each got an equal share. Show what fraction of the candy bar Kim kept for herself using the number line below.



Planting Flowers (ECR)

Overview

Students will solve word problems involving multiplication and division.

Standards

Represent and solve problems involving multiplication and division.

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

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Multiply and divide within 100.

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two 1-digit numbers.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.A.1	• 2.OA.C.3 • 2.OA.C.4	1. Write a sentence that could be represented by the expression 5 x 8 based on the number of stickers Sophia received from friends. a. Sophia received 5 stickers from each of 8 friends. OR Sophia received 8 stickers from each of 5 friends.	• http://www.illustrativemathematics.org/illustrations/620 • http://www.illustrativemathematics.org/illustrations/3 • http://learnzillion.com/lessonsets/395-interpret-products-of-whole-numbers-using-pictures-arrays-and-number-lines • http://learnzillion.com/lessonsets/379-interpret-products-of-whole-numbers-and-model-multiplication-using-arrays-pictures-and-equations • http://learnzillion.com/lessonsets/273-interpret-products-of-whole-numbers
3.OA.A.3	• 3.OA.A.1	1. Kenya bought 6 small picture frames. Each picture frame cost $3. How much	• http://learnzillion.com/lessonsets/611-solve-multiplication-and-division-word-problems

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		did Kenya spend on the picture frames? Write an equation to show how you found your answer. a. 6 x $3 = $18; she spent $18. 2. Jaleel arranged a classroom into 4 rows of 7 desks. How many total desks were in the arrangement? a. There were 28 desks in all. 3. http://www.illustrativemathematics.org/illustrations/365 4. http://www.illustrativemathematics.org/illustrations/262	• http://learnzillion.com/lessonsets/303-solve-word-problems-with-multiplication-and-division
3.OA.C.7	• 3.OA.B.5 • 3.OA.B.6	1. What is 4 x 6? a. 24 2. What is 8 x 7? a. 56	• http://learnzillion.com/lessonsets/396-multiply-and-divide-within-100 • http://learnzillion.com/lessonsets/302-multply-and-divide-within-100

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a garden?** A piece of ground, often near a house, used for growing flowers, fruit, or vegetables.
- **What is a tulip?** A spring-flowering plant of the lily family, with boldly colored cup-shaped flowers.

After the Task:

The students may struggle with the concept of applying money to a multiplication problem. If this is the case provide students with paper money to use with problem solving that involves money. If students struggle with changing the array in step 2b, provide manipulatives to model an array and then add to the array to show changes to the equation by adding rows or columns.

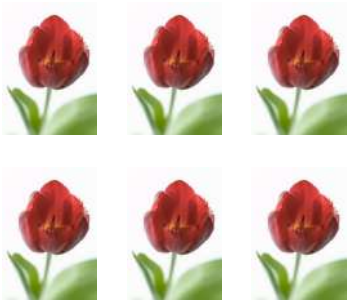
Student Extended Constructed Response

Jenny is planting a spring flower garden. The table below shows the plants she wants to purchase for her garden and the price for each plant.

Plant	Tulip 	Daisy 	Rose 
Price	$3.00	$2.00	$4.00

1. Jenny bought 6 rose plants. How much money did she spend? Write an equation to show how you found your answer.

2. A model of a part of Jenny's garden is shown below.



   a. Jenny wrote the equation $2 \times 3 = \square$ to represent the number of tulip plants she planted in her garden. Explain what the equation means based on the model above.

   b. Draw a new model to show how your array would change if Jenny added 2 more tulip plants to **each row**. How many tulip plants would Jenny have in her garden based on your model?

3. Jenny spent $18.00 on daisy plants. How many daisy plants did she buy? Show how you found your answer using an equation with a symbol for the unknown number.

4. If Jenny had $12.00 to spend, show 3 possible combinations of plants that Jenny could buy if she spent all $12.00 with no money left over. Make sure to include equations using multiplication or division for each combination.

Combinations	Equation

Extended Constructed Response Exemplar Response

Jenny is planting a spring flower garden. The table below shows the plants she wants to purchase for her garden and the price for each plant.

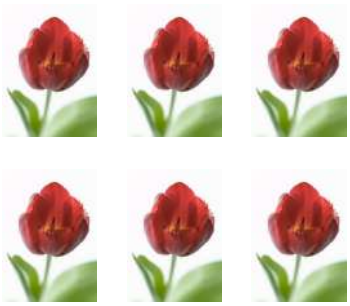
Plant	Tulip 	Daisy 	Rose 
Price	$3.00	$2.00	$4.00

1. Jenny bought 6 rose plants. How much money did she spend? Write an equation to show how you found your answer.

   Jenny spent $24.00.

   6 x $4.00 = $24.00

2. A model of a part of Jenny's garden is shown below.



   a. Jenny wrote the equation $2 \times 3 = \square$ to represent the number of tulip plants she planted in her garden. Explain what the equation means based on the model above.

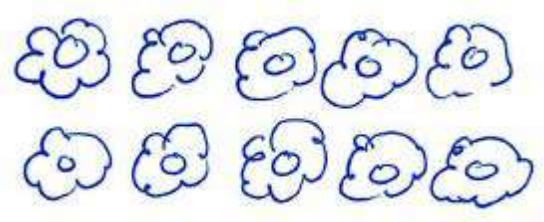
      The equation means she has 2 rows of 3 tulip plants in each row.

      OR

      The equation means she has 3 groups of 2 tulip plants.

b. Draw a new model to show how your array would change if Jenny added 2 more tulip plants to **each row**. How many tulip plants would Jenny have in her garden based on your model?

Jenny would have 10 tulip plants in her garden.



3. Jenny spent $18.00 on daisy plants. How many daisy plants did she buy? Show how you found your answer using an equation with a symbol for the unknown number.

$$\$2 \times \square = \$18$$

I know that 2 x 9 = 18 so Jenny bought 9 daisy plants.

***Note: Students may use different equations. Any equation that correctly relates the values 2 and 18 with a symbol (or letter) representing the unknown amount should be considered correct.*

4. If Jenny had $12.00 to spend, show 3 possible combinations of plants that Jenny could buy if she spent all $12.00 with no money left over. Make sure to include equations using multiplication or division for each combination.

Combinations	**Equation**
Jenny can buy 4 tulip plants	*4 x $3 = $12*
Jenny can buy 2 tulip plants and 3 daisy plants.	*2 x $3 = $6* *3 x $2 = $6* *$6 + $6 = $12*
Jenny can by 2 tulip plants, 1 daisy plant, and 1 rose plant.	*2 x $3 = $6* *1 x $2 = $2* *1 x $4 = $4* *$6 + $2 + $4 = $12*

***Note: There are many different combinations students can make with the given amounts. Students must have equations to show that their combinations will cost $12.*

Going to the Fair (ECR)

Overview

Students will use multiplication and division to solve problems involving a family that has gone to a fair. Students will also create a picture graph to show how much money the family spent on various rides and games.

Standards

Represent and solve problems involving multiplication and division.

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?*

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

3.OA.B.5 Apply properties of operations as strategies to multiply and divide. *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).*

Multiply and divide within 100.

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two 1-digit numbers.

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

3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

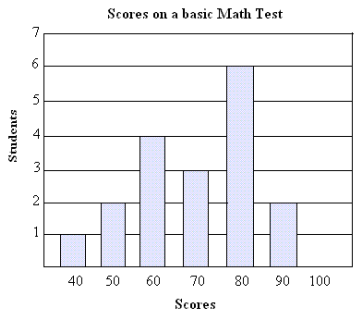
Represent and interpret data.

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.A.3	• 3.OA.A.1 • 3.OA.A.2	1. Levi bought 3 candy bars. Each candy bar cost $2. How much money did Levi spend on candy bars? a. Levi spent $6 on candy bars. 2. http://www.illustrativemathematics.org/illustrations/344 3. http://www.illustrativemathematics.org/illustrations/365	• http://www.illustrativemathematics.org/illustrations/1531 • http://learnzillion.com/lessonsets/611-solve-multiplication-and-division-word-problems
3.OA.A.4		1. What is the value of ◆ in the equation 5 x ◆ = 35? a. 7 2. What is the value of ◆ in the equation 8 = ◆÷ 6? a. 48 3. http://www.illustrativemathematics.org/illustrations/1814	• http://learnzillion.com/lessonsets/304-determine-unknown-whole-numbers-in-multiplication-or-division-equations
3.OA.B.5	• 3.OA.A.1 • 3.OA.A.2	1. Rewrite the expression $(6 \times 3) + (6 \times 5)$ as the product of two numbers. a. 6×8	• http://www.illustrativemathematics.org/illustrations/1540 • http://learnzillion.com/lessonsets/226-apply-properties-of-operations-as-strategies-to-multiply-and-divide
3.OA.C.7	• 3.OA.B.5 • 3.OA.B.6	1. If you know $7 \times 3 = 21$, write another equation with 3, 7, and 21 that is also true. a. $3 \times 7 = 21$ or $21 \div 7 = 3$ or $21 \div 3 = 7$. 2. Find 9×8. a. 72	• http://learnzillion.com/lessonsets/396-multiply-and-divide-within-100 • http://learnzillion.com/lessonsets/302-multply-and-divide-within-100
3.OA.D.8	• 2.OA.A.1 • 3.OA.A.3	1. Johanna bought some hot dogs and some drinks at the fair. She paid $17.00 for all of the items she bought. She paid $8.00 for the drinks. How much did each hot dog cost? a. $3.00 2. http://www.illustrativemathematics.org/illustrations/13 3. http://www.illustrativemathematics.org/illustrations/1301	• http://www.illustrativemathematics.org/illustrations/1 • http://learnzillion.com/lessonsets/318-solving-two-step-word-problems-including-those-with-unknown-quantities
3.MD.B.3	•	1. Use the bar graph below to answer the questions that follow.	• http://learnzillion.com/lessonsets/655-draw-scaled-picture-and-bar-graphs

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		 a. How many more students scored an 80 than those students that scored a 50 on the test? i. 4 students b. How many students took the test? i. 18 students	• http://learnzillion.com/lessonsets/569-answer-questions-using-information-in-scaled-picture-and-bar-graphs

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a fair?** A fair is a local event where there are rides and games for people to enjoy. The fair usually celebrates some aspect of the community and allows many people to highlight talents.

After the Task:

- In problems where students are asked to write equations to show how the problem was solved, be sure students are using the equal sign correctly. Some students may write expressions only. Remind students about the difference between equations and expressions and have them write the correct equations for each of the problems given.
- **For problem 1c**, students may not see the structure in the expressions they used for parts a and b. Provide struggling students with additional practice on the distributive property.
- **For problem 3**, students may include the amount of money Angelica received from her grandmother in their calculations. Have students read the problem carefully and identify key phrases, and ask them how they can represent those phrases mathematically.
- **For problem 7**, students may have difficulty deciding on a scale to use to create the graph of the amount of money spent. Be sure that students are using the information from Part II to find the amount of money spent. Students will have to use a picture or symbol that represents more than one dollar to be able to fit the graph on the grid that is provided. Provide struggling students with extra practice reading and creating picture graphs that have a variety of scales.

Student Extended Constructed Response

Part I:

A grandmother, Ms. Grayson, is taking her adult children and her grandchildren to the fair, where they will play games and go on rides.

1. Tickets to go into the fair cost $4 for each person. Ms. Grayson paid for her 5 grandchildren, her 2 adult daughters, and herself, to go into the fair.

    a. How much did Ms. Grayson spend on her grandchildren's tickets? Write an equation to show how you solved the equation.

    b. How much did Ms. Grayson spend on adult tickets? Write an equation to show how you solved the equation.

    c. Using the equations you wrote in parts a and b, write a new equation to show the total amount Ms. Grayson paid for tickets to go into the fair.

    (___ × ___) + (___ × ___) = ___ × ___

    d. What is the total amount Ms. Grayson spent on tickets?

2. Ms. Grayson gave a total of $45 to her 5 grandchildren for games and rides. Each grandchild received the same amount of money. How much money did each grandchild receive? Write two different equations that would be used to solve this problem.

Part II:

At the fair, Ms. Grayson's grandchildren can choose how to spend their money. Use the chart of game and ride prices to answer questions 3-6.

Game and Ride Prices *Note: Prices are for 1 ride or game*	
Bumper Cars	$3
Ferris Wheel	$2
High Swings	$4
Ring Toss	$1
Basketball Toss	$2

3. Angelica, one of Ms. Grayson's grandchildren, brought some money from home. Together with the money her grandmother gave her, she has $12. She decides to spend her money on riding the bumper cars as many times as she can. What is the greatest number of times Angelica can ride the bumper cars, using the money she has?

4. Jackson spent some of his money riding the Ferris wheel. He spent $6 on the Ferris wheel. Use the equation $2 × f = $6 to determine how many times Jackson rode the Ferris wheel. What does f represent?

5. Ms. Lind, who is Ms. Grayson's adult daughter, paid for everyone in their family who is at the fair (the 5 children, Ms. Grayson, her sister, and herself) to play ring toss twice. How much did Ms. Lind pay for each person to play ring toss twice? Use models, pictures, equations, or words to show how you found your answer.

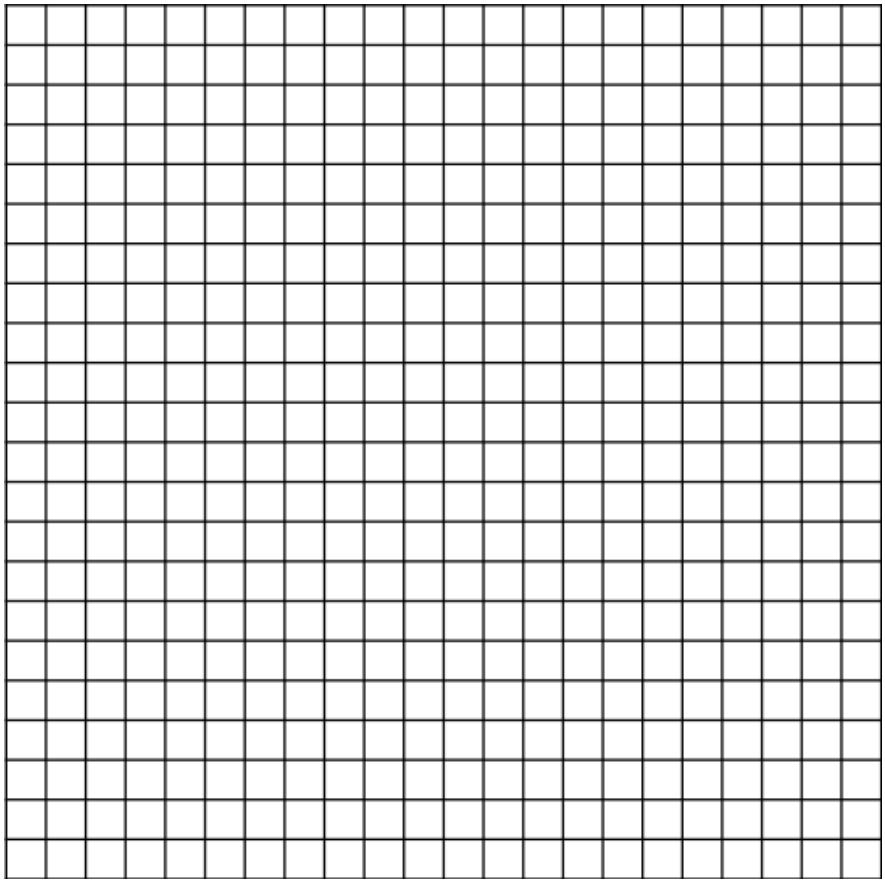
6. Ms. Westin, Ms. Grayson's other adult daughter, paid for different family members to have rides on the high swings. If she spent $40, how many rides did she pay for? Show or explain how you found your answer.

Part III

Ms. Grayson counted the number of times that someone in her family rode each ride or played each game.

- Number of bumper car rides: 8
- Number of Ferris wheel rides: 6
- Number of high swing rides: 10
- Number of ring toss games: 16
- Number of basketball toss games: 9

7. Using the information Ms. Grayson collected and the prices of the games and rides from Part II, create a picture graph that shows the amount of **money** the family spent on each game or ride. Remember to label your graph and provide a key.



8. Use the picture graph you created in question 7 to answer the following:
    a. How much more money was spent on the high swings than the bumper cars? Write an equation to show how you found your answer.

    b. How many more games of ring toss would have to be played in order for the family to have spent the same amount of money as they spent on basketball toss? Explain how you found your answer.

Extended Constructed Response Exemplar Response

Part I:

A grandmother, Ms. Grayson, is taking her adult children and her grandchildren to the fair, where they will play games and go on rides.

1. Tickets to go into the fair cost $4 for each person. Ms. Grayson paid for her 5 grandchildren, her 2 adult daughters, and herself, to go into the fair.

    a. How much did Ms. Grayson spend on her grandchildren's tickets? Write an equation to show how you solved the equation.

    $\$4 \times 5 = ?$ *Ms. Grayson spent $20 on children's admittance.*

    b. How much did Ms. Grayson spend on adult tickets? Write an equation to show how you solved the equation.

    $\$4 \times 3 = ?$ *Ms. Grayson spent $12 on adult admittance.*

    c. Using the equations you wrote in parts a and b, write a new equation to show the total amount Ms. Grayson paid for tickets to go into the fair.

    $$(\$4 \times 5) + (\$4 \times 3) = \$4 \times 8$$

    d. What is the total amount Ms. Grayson spent on tickets?

    Ms. Grayson spent a total of $32 on tickets to the fair.

2. Ms. Grayson gave a total of $45 to her 5 grandchildren for games and rides. Each grandchild received the same amount of money. How much money did each grandchild receive? Write two different equations that would be used to solve this problem.

    $\$45 \div 5 = m$ *or* $5 \times m = \$45$

    Ms. Grayson gave each of her grandchildren $9.

Part II:

At the fair, Ms. Grayson's grandchildren can choose how to spend their money. Use the chart of game and ride prices to answer questions 3-6.

Game and Ride Prices *Note: Prices are for 1 ride or game*	
Bumper Cars	$3
Ferris Wheel	$2
High Swings	$4
Ring Toss	$1
Basketball Toss	$2

3. Angelica, one of Ms. Grayson's grandchildren, brought some money from home. Together with the money her grandmother gave her, she has $12. She decides to spend her money on riding the bumper cars as many times as she can. What is the greatest number of times Angelica can ride the bumper cars, using the money she has?

   The greatest number of times Angelica can ride the bumper cars is 4 times.

4. Jackson spent some of his money riding the Ferris wheel. Jackson spent $6 on the Ferris wheel. Use the equation $\$2 \times f = \$6$ to determine how many times Jackson rode the Ferris wheel. What does *f* represent?

   f represents the number of times Jackson can ride the Ferris wheel. He can ride the Ferris wheel 3 times.

5. Ms. Lind, who is Ms. Grayson's adult daughter, paid for everyone in their family who is at the fair (the 5 children, Ms. Grayson, her sister, and herself) to play ring toss twice. How much did Ms. Lind pay for each person to play ring toss twice? Use models, pictures, equations, or words to show how you found your answer.

   5 children + 3 adults = 8 people

   $\$1 \times 8\ people = \$8$ *for one game.*

   $\$8 \times 2\ games = \$16$ *for two games.*

   ***Note: Students may use different equations or drawings to show how they found the answer.*

6. Ms. Westin, Ms. Grayson's other adult daughter, paid for rides on the high swings. If she spent $40, how many rides did she pay for? Show or explain how you found your answer.

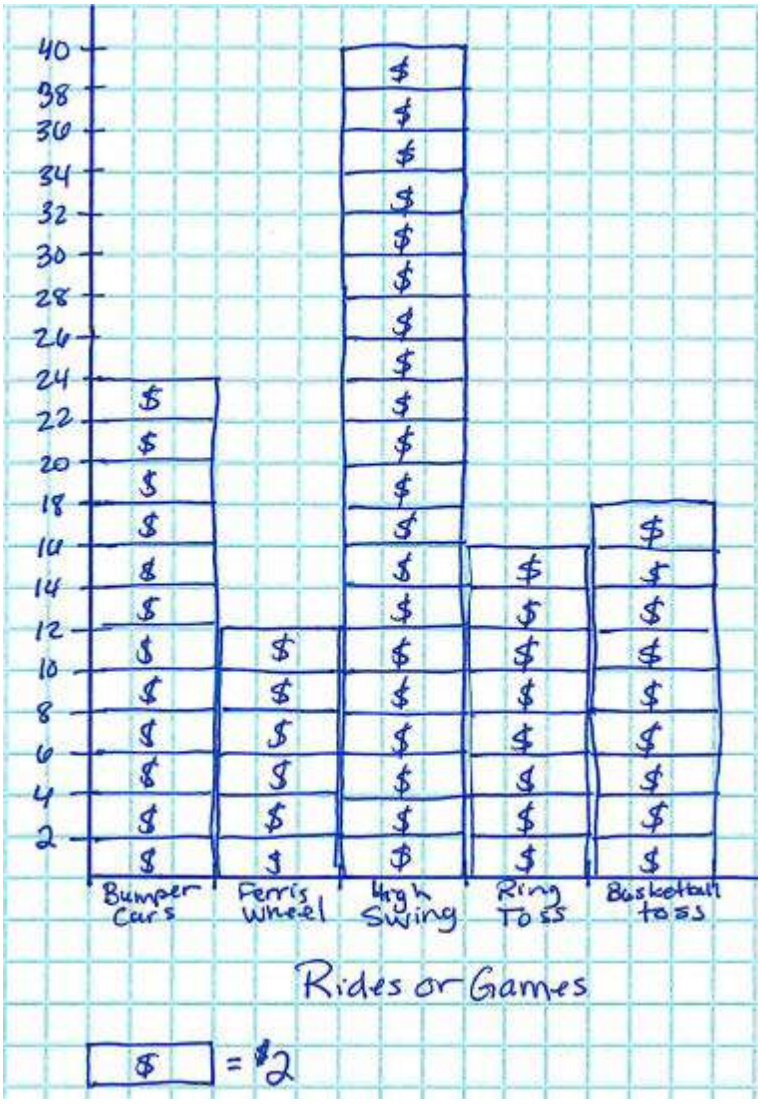
   It costs $4 to ride the high swings one time and I know that 4 x 10 = 40, so Ms. Westin paid for 10 rides on the high swings.

Part III

Ms. Grayson counted the number of times that someone in her family rode each ride or played each game.

- Number of bumper car rides: 8
- Number of Ferris wheel rides: 6
- Number of high swing rides: 10
- Number of ring toss games: 16
- Number of basketball toss games: 9

7. Using the information Ms. Grayson collected and the prices of the games and rides from Part II, create a picture graph that shows the amount of **money** the family spent on each game or ride. Remember to label your graph and provide a key.



Students may use a different scale for the graph. The graph should be labeled and scaled appropriately.

8. Use the picture graph you created in question 7 to answer the following:

    a. How much more money was spent on the high swings than the bumper cars? Write an equation to show how you found your answer.

    $40 - $24 = $16

    They spent $16 more on high swings than bumper cars.

    b. How many more games of ring toss would have to be played in order for the family to have spent the same amount of money as they spent on basketball toss? Explain how you found your answer.

    They spent $18 on basketball toss and $16 on ring toss. I subtracted 18-16 and found that they spent $2 more on basketball toss. Since ring toss costs $1 per game, they will have to play 2 more games of ring toss to spend the same amount as on basketball.

Time Intervals (IT)

Overview

Students will apply their understanding of time intervals to answer questions about the time a family spent in the bathroom in the morning.

Standards

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

3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.MD.A.1	• 2.MD.B.6 • 2.MD.C.7	1. Marco woke up at 6:15 a.m. He got on the bus to go to school at 6:53 a.m. How long did it take Marco to get ready to go to school? a. 38 minutes 2. Addyson spent 25 minutes on her math homework. Then she spent 32 minutes on her reading homework. How much total time did Addyson spend on homework? a. 57 minutes	• http://www.illustrativemathematics.org/illustrations/1081 • http://www.illustrativemathematics.org/illustrations/1069 • http://learnzillion.com/lessonsets/173-solve-elapsed-time-word-problems • http://learnzillion.com/lessonsets/139-tell-write-and-measure-time-to-the-minute

During the Task:

- Allow students to work in groups to complete the chart. Students will have to use their understanding of place value as well as writing time to the nearest minute to determine which values are missing in the chart.
- Some students might have trouble deciding how to begin finding the end time for Carly. Ask students, "What information are you given about Carly's end time? When we write time, how many digits do we use for minutes?" Guide students to determine that the time can be between 6:30 a.m. and 6:33. a.m. (inclusive). Remind students that Carly's end time cannot be after Todd's start time.
- Remind students that all family members listed in the chart spent more than 10 minutes in the bathroom. Students who forget this information might use only 3 minutes to determine Todd's end time. Guide students to use the start time for Grandma to limit the possibilities for the number of minutes Todd spent in the bathroom.

- For question 4 in Part II, if students struggle when trying to add all five times at once, encourage them to add the time spent using two values at a time or by adding easier values first (i.e., 30 + 30 = 60 and 60 + 31 = 91).

After the Task:

Have students track the amount of time it takes for them to perform various activities at home and at school. Some activities might include brushing teeth, eating supper, doing homework, playing outside, and watching television. Another option is to have students make a list of everything they do throughout a day. Students could then use this list to track the start times and end times for each activity. When students return to class with the times, have them determine the amount of time spent on each activity and then answer questions requiring them to add and subtract time intervals from their day.

Student Instructional Task

Part I

The Weston family's house is very busy in the mornings, especially since there is only one bathroom. Todd, one of the three children, decided to create a chart to see how much time each person spends in the bathroom in the morning. The baby, Jax, erased some of the numbers on Todd's chart. The chart is shown below.

Person	Activities	Start Time	End Time	Time Spent
Mom	Brush teeth, shower, wash hair, dry hair	5:00 a.m.	5:30 a.m.	
Dad	Brush teeth, shower, shave	5:35 a.m.	5:59 a.m.	
Carly	Brush teeth, shower	6:02 a.m.	6:3	minutes
Todd	Brush teeth, shower	6:33 a.m.		3 minutes
Grandma	Brush teeth, shower, wash hair	6:5		31 minutes

Todd is working to fill in his chart so that he can share it with his family. Todd remembers that everyone spent more than 10 minutes but less than 60 minutes in the bathroom in the morning. Using the information you can see in the chart above, help Todd fill in the missing pieces of the chart below. Use clocks, models, or other tools to help you.

Person	Activities	Start Time	End Time	Time Spent
Mom	Brush teeth, shower, wash hair, dry hair	5:00 a.m.	5:30 a.m.	
Dad	Brush teeth, shower, shave	5:35 a.m.	5:59 a.m.	
Carly	Brush teeth, shower	6:02 a.m.		
Todd	Brush teeth, shower	6:33 a.m.		
Grandma	Brush teeth, shower, wash hair			31 minutes

Part II

Use the chart you helped Todd fill in on the first page to answer the following questions.

1. Who spent the most time in the bathroom? How much time did he or she spend in the bathroom?

2. Who spent the least amount of time in the bathroom? How much time did he or she spend in the bathroom?

3. How much longer did Mom spend in the bathroom than Dad? Show your work.

4. What is the total amount of time the family spent in the bathroom in the morning? Show your work.

Instructional Task Exemplar Response

Part I

The Weston family's house is very busy in the mornings, especially since there is only one bathroom. Todd, one of the three children, decided to create a chart to see how much time each person spends in the bathroom in the morning. The baby, Jax, erased some of the numbers on Todd's chart. The chart is shown below.

Person	Activities	Start Time	End Time	Time Spent
Mom	Brush teeth, shower, wash hair, dry hair	5:00 a.m.	5:30 a.m.	
Dad	Brush teeth, shower, shave	5:35 a.m.	5:59 a.m.	
Carly	Brush teeth, shower	6:02 a.m.	6:3	inutes
Todd	Brush teeth, shower	6:33 a.m.		3 minutes
Grandma	Brush teeth, shower, wash hair	6:5		31 minutes

Todd is working to fill in his chart so that he can share it with his family. Todd remembers that everyone spent more than 10 minutes but less than 60 minutes in the bathroom in the morning. Using the information you can see in the chart above, help Todd fill in the missing pieces of the chart below. Use clocks, models, or other tools to help you.

Person	Activities	Start Time	End Time	Time Spent
Mom	Brush teeth, shower, wash hair, dry hair	5:00 a.m.	5:30 a.m.	*30 minutes*
Dad	Brush teeth, shower, shave	5:35 a.m.	5:59 a.m.	*24 minutes*
Carly	Brush teeth, shower	6:02 a.m.	*6:32 a.m.*	*30 minutes*
Todd	Brush teeth, shower	6:33 a.m.	*6:46 a.m.*	*13 minutes*
Grandma	Brush teeth, shower, wash hair	*6:50 a.m.*	*7:21 a.m.*	31 minutes

***Note: Carly's end time can be no earlier than 6:30 a.m. and can end no later than 6:33 a.m.; the time spent for Carly should be accurate based on the time the student chooses. For Todd, the number of minutes for time spent should end with a 3 and because everyone spends more than 10 minutes but less than 60 minutes, time spent for Todd can be 13*

minutes or 23 minutes. The end time for Todd should correspond to that choice. Finally, the start time for Grandma can be any time between 6:50 a.m. and 6:59 a.m.

Part II

Use the chart you helped Todd fill in on the first page to answer the following questions.

***Note: All answers in this exemplar are sample responses based on the sample times listed in the chart on page one.*

1. Who spent the most time in the bathroom? How much time did he or she spend in the bathroom?

   Grandma spent the most time in the bathroom. She spent 31 minutes in the bathroom.

2. Who spent the least amount of time in the bathroom? How much time did he or she spend in the bathroom?

   Todd spent the least amount of time in the bathroom. He spent 13 minutes in the bathroom.

3. How much longer did Mom spend in the bathroom than Dad? Show your work.

   30 – 24 = 6

   Mom spent 6 minutes more in the bathroom than Dad.

4. What is the total amount of time the family spent in the bathroom in the morning? Show your work.

   30 + 24 + 30 + 13 + 31 = 54 + 30 + 13 + 31 = 84 + 13 + 31 = 97 + 31 = 128 minutes

   The family spent 128 minutes in the bathroom.

Harry's Day (IT)

Overview

Students will help Harry throughout his day by solving various multiplication problems using arrays, equal groups, and repeated addition.

Standards:

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

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.A.1	• 2.OA.C.3 • 2.OA.C.4	1. Amanda used the equation 6 x 8 = 48 to find the total number of cookies she baked. Tell what each number in the equation means. a. There are 6 rows of cookies with 8 cookies in each row, which is a total of 48 cookies.	• http://www.illustrativemathematics.org/illustrations/620 • http://www.illustrativemathematics.org/illustrations/3 • http://learnzillion.com/lessonsets/395-interpret-products-of-whole-numbers-using-pictures-arrays-and-number-lines • http://learnzillion.com/lessonsets/379-interpret-products-of-whole-numbers-and-model-multiplication-using-arrays-pictures-and-equations • http://learnzillion.com/lessonsets/273-interpret-products-of-whole-numbers • http://learnzillion.com/lessonsets/60-solve-realworld-multiplication-problems
3.OA.A.3	• 3.OA.A.1 • 3.OA.A.2	1. Jarrod counted the number of lettuce plants in his garden. He counted 4 rows of 8 plants. How many lettuce plants are there in Jarrod's garden? a. 32 plants 2. http://www.illustrativemathematics.org/illustrations/365 3. http://www.illustrativemathematics.org/illustrations/262	• http://www.illustrativemathematics.org/illustrations/1531 • http://www.illustrativemathematics.org/illustrations/1540 • http://learnzillion.com/lessonsets/611-solve-multiplication-and-division-word-problems • http://learnzillion.com/lessonsets/62-solve-realworld-division-problems • http://learnzillion.com/lessonsets/60-solve-realworld-multiplication-problems

During the Task:

- As students work through this task, the teacher should have various manipulatives available so students can use them to answer the questions. Manipulatives may include counters, unit cubes, pictures of the items in the task, or the actual items used in the task.
- Ask students to explain how the multiplication equations they write for each part of the task match the drawings, repeated addition, and arrays they used to find the total. Students should use the context of each question in their explanation.
- For part 4, discuss with students other possible activities Harry and his family could be involved in during their outing. As students brainstorm a list of activities, record their ideas on the board. This will provide some starting points for students to create their own story problems. After students have created the story problems, have students exchange problems and solve the new problem they received.

After the Task:

Lead students in a discussion about the activities they would like to do as a class. After this is discussed, have students use the activities they listed to create story problems that would be solved using multiplication. After creating the scenarios, the students can exchange their problems with other groups. After solving the new problems, have students discuss they strategies they used to find the answers.

Student Instructional Task

There are 5 people in Harry's family. They are all going to the park today.

1. In the morning, Harry's mom asks him to make snack bags for his family's trip to the park. She gives him 5 bags to fill with snacks and all of the snacks for each bag.
    a. If Harry puts 9 pretzels in each bag, what is the total number of pretzels Harry will use? Use drawings to show how you found your answer. Write the multiplication equation that matches your drawing.

    b. If Harry adds 7 chocolate candies to each bag, what is the total number of chocolate candies he will use? Use repeated addition to show how you found your answer. Write the multiplication equation that matches the repeated addition.

    c. Harry wrote the equation 5 x 10 = 50 when he added crackers to the bags. Describe what each number in the equation represents.

    d. Write a multiplication equation to show the total number of peanuts Harry's mom gave him if each bag should have 4 peanuts. How many total peanuts did Harry's mom give him?

2. Harry's mom also wants him to help make sandwiches for the family. If each family member eats two sandwiches, how many total slices of ham will Harry need to make the sandwiches if he puts two slices of ham on each sandwich? Use drawings, equations, or words to show how you found your answer.

3. At the park, Harry's family finds rocks for Harry's rock collection.
    a. Each family member found 3 rocks for Harry's collection. Draw an array that shows the total number of rocks Harry will add to his collection. What is the total number of rocks Harry will add to his collection?

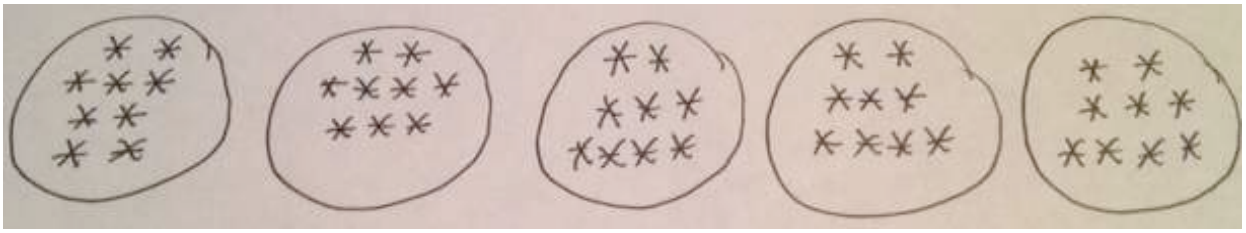
    b. Write a multiplication equation that matches the array to find the total number of rocks Harry will add to his collection.

4. Write your own story problem about an activity in Harry's day. Be sure to include an activity that will require multiplication to find the answer. Show how you can find the answer to your story problem using drawings, repeated addition, an array, and a multiplication equation.

Instructional Task Exemplar Response

There are 5 people in Harry's family. They are all going to the park today.

1. In the morning, Harry's mom asks him to make snack bags for his family's trip to the park. She gives him 5 bags to fill with snacks and all of the snacks for each bag.
    a. If Harry puts 9 pretzels in each bag, what is the total number of pretzels Harry will use? Use drawings to show how you found your answer. Write the multiplication equation that matches your drawing.



5 x 9 = 45

    b. If Harry adds 7 chocolate candies to each bag, what is the total number of chocolate candies he will use? Use repeated addition to show how you found your answer. Write the multiplication equation that matches the repeated addition.

7 + 7 + 7 + 7 + 7 = 35

5 x 7 = 35

    c. Harry wrote the equation 5 x 10 = 50 when he added crackers to the bags. Describe what each number in the equation represents.

There are 5 bags. Harry added 10 crackers to each bag. Harry used a total of 50 crackers.

    d. Write a multiplication equation to show the total number of peanuts Harry's mom gave him if each bag should have 4 peanuts. How many total peanuts did Harry's mom give him?

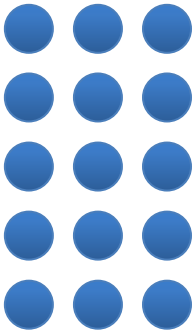
5 x 4 = 20; He used 20 total peanuts.

2. Harry's mom also wants him to help make sandwiches for the family. If each family member eats two sandwiches, how many total slices of ham will Harry need if he puts two slices of ham on each sandwich? Use drawings, equations, or words to show how you found your answer.

If each family member eats two sandwiches, then they will eat a total of 10 sandwiches because 5 x 2 = 10. If each sandwich needs 2 slices of ham, then Harry will need 20 slices of ham because 10 x 2 = 20.

Note: Student responses may vary and may be presented in the form of drawings, equations, and/or words.

3. At the park, Harry's family finds rocks for Harry's rock collection.
    a. Each family member found 3 rocks for Harry's collection. Draw an array that shows the total number of rocks Harry will add to his collection. What is the total number of rocks Harry will add to his collection?



Harry will add 15 rocks to his collection.

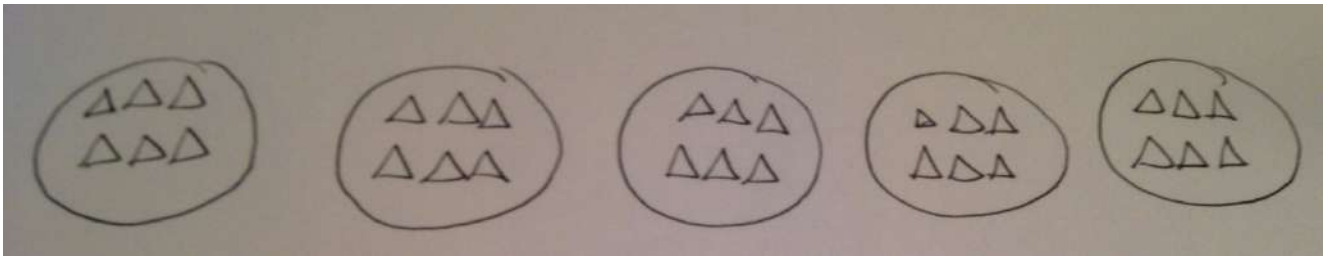
    b. Write a multiplication equation that matches the array to find the total number of rocks Harry will add to his collection.

5 x 3 = 15

4. Write your own story problem about an activity in Harry's day. Be sure to include an activity that will require multiplication to find the answer. Show how you can find the answer to your story problem using drawings, repeated addition, an array, and a multiplication equation.

Sample response: Each member of Harry's family rode his or her bike 6 laps around the park. How many total laps did Harry's family ride on their bikes?

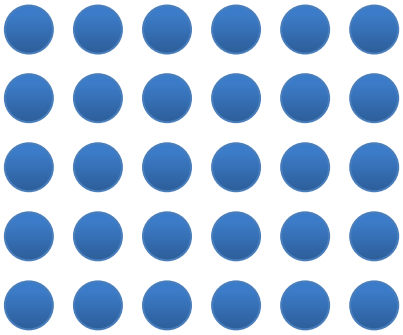
Drawing: They rode a total of 30 laps.



Repeated addition: 6 + 6 + 6 + 6 + 6 = 30

The family rode a total of 30 laps.

Array: The family rode a total of 30 laps.



Multiplication equation: 5 x 6 = 30 laps

Arianna's Birthday Party (IT)

Overview

Students will use multiplication and division to answer questions about birthday party plans and activities.

Standards

Represent and solve problems involving multiplication and division.

3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

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

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

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

3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.A.3	• 3.OA.A.1 • 3.OA.A.2	1. Michael gave 6 pieces of candy to each of his 4 friends. How many total pieces of candy did he give out? a. 24 pieces of candy 2. Aleyna has 45 stickers that she wants to give to friends. She wants to give each of her friends 9 stickers. How many friends will Aleyna share her stickers with? a. 5 friends 3. http://www.illustrativemathematics.org/illustrations/344 4. http://www.illustrativemathematics.org/illustrations/365 5. http://www.illustrativemathematics.org/illustrations/262	• http://www.illustrativemathematics.org/illustrations/1531 • http://learnzillion.com/lessonsets/611-solve-multiplication-and-division-word-problems
3.OA.B.6		1. What multiplication fact can help you answer $42 \div \blacksquare = 7$? a. $7 \times \blacksquare = 42$	• http://learnzillion.com/lessonsets/341-understand-division-as-unknownfactor-problems

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.D.8	• 2.OA.A.1 • 3.OA.A.3	1. Brandon has a collection of 67 baseball cards. He wants to share some of his baseball cards with 6 friends. He kept 25 baseball cards for himself. If Brandon shared the remaining baseball cards equally with his friends, how many baseball cards did each friend receive? a. Each friend received 7 baseball cards. 2. http://www.illustrativemathematics.org/illustrations/13 3. http://www.illustrativemathematics.org/illustrations/1301	• http://www.illustrativemathematics.org/illustrations/1 • http://learnzillion.com/lessonsets/318-solving-two-step-word-problems-including-those-with-unknown-quantities

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is an arcade?** An arcade in a place that has a collection of video games that customers pay to play. Some games in the arcade give tickets when players earn different levels of points. Those tickets can then be traded in for prizes at the arcade.
- **What is a bouncy castle?** A bouncy castle is an inflatable trampoline that some people rent for children to jump and play in at parties. There are some businesses that have a set of these inflatables indoors for children's parties.
- **What is a carpool?** A carpool is when people decide to use one vehicle to transport more than one person rather than using multiple vehicles to transport the same people. People who live near each other and work at the same office will often carpool to save money on gas.

During the Task:

- Struggling readers may need some assistance with completing this task. Group struggling readers with students who read more fluently and have students read the problems aloud in groups.
- Encourage students who may struggle with writing an equation or expression to draw a picture first. Then ask students to explain what their picture represents and have them connect the drawing to a written equation.
- Have students working in groups explain the reasoning they used to each of the members of the group. Have students identify methods other students have used that are different from the method they have used. Encourage students to ask questions of their classmates to clarify their understanding of the different methods they each use.
- For those students who need more concrete work before creating drawings and equations for the scenarios, provide manipulatives to represent the various situations in the problems.

After the Task:

Have students work to plan an activity in which the class could participate. This could be something like a class party or a field trip. Provide students with information they would use to plan the activity that would require them to use the four operations to determine quantities needed in the activity. Have students then participate in the activity to see how the math they used in planning helps the activity to be successful.

Student Instructional Task

Arianna is planning her birthday party with her family. They decide to have the birthday party at the local Activity Zone, where her friends can play all sorts of games and eat a variety of good snacks. As Arianna and her family plan the birthday party they run into a couple of challenges.

Help Arianna plan a great birthday party.

ACTIVITY ZONE

Video Game Arcade Maximum 6 people	Bouncy Castle Maximum 8 people
Swimming Pool Maximum 10 people	Basketball Court Maximum 10 people

Is there enough space? 30 people are attending the birthday party, including Arianna. The picture above shows which rooms are available and how many people can be in each room. Use the diagram above to help you answer the following.

a. Is there enough space for all of her friends? Show how you know your answer is correct.

b. If Arianna wants the same number of people in the swimming pool and basketball court when the arcade and bouncy castle are full, how many friends will need to be in the swimming pool and basketball court? Show how you found your answer.

Will the carpool work? Arianna plans a carpool using 6 vans to help her friends get to the party. All the friends, including Arianna, ride in the vans. How many people attending the party will need to fit in each van, if each van has the same number of people? Write and solve a multiplication or division equation that represents Arianna's carpool problem. Be sure to use a letter in your equation. Explain how you solved your equation.

A prize for Arianna: Five of Arianna's friends decide to use the tickets they won in the arcade to get a prize for Arianna. Each friend has won 8 tickets so far. The prize they want to get, a pink purse, costs 90 tickets. How many more tickets must each friend win in order to be able to get the prize?

Making sense of her presents: Arianna had a great birthday party and received 44 gifts at the party. All of her friends brought either 1 or 2 gifts.

a. If all of her friends gave her at least 1 gift, how many gave her 2 gifts?

b. When she distributed thank-you cards to all 29 friends at school on Monday, 5 friends said they forgot to give her their gift. After learning this, how many friends gave Arianna 2 gifts? Show how you found your answers using drawings or equations.

Instructional Task Exemplar Response

Arianna is planning her birthday party with her dad. They decide to have the birthday party at the local Activity Zone, where her friends can play all sorts of games and eat a variety of good snacks. As Arianna and her dad plan the birthday party they run into a couple of challenges.

Help Arianna plan a great birthday party.

ACTIVITY ZONE

Video Game Arcade Maximum 6 people	Bouncy Castle Maximum 8 people
Swimming Pool Maximum 10 people	Basketball Court Maximum 10 people

Is there enough space? 30 people are attending the birthday party, including Arianna. The picture above shows which rooms are available and how many people can be in each room. Use the diagram above to help you answer the following.

a. Is there enough space for all of her friends? Show how you know your answer is correct.

Yes there is enough space.

***Students can show there is enough space many ways.*

- *They might add 6 and 8 to get 14, subtract 14 from 30 to find there are 16 people left and say that the last two rooms (swimming and basketball) can hold up to 20, which is more than 16.*
- *They might add all of the maximums to get 34, which is more than 30, so there is enough space.*
- *They might draw 30 people in the rooms in the diagram above.*

b. If Arianna wants the same number of people in the swimming pool and basketball court when the arcade and bouncy castle are full, how many friends will need to be in the swimming pool and basketball court? Show how you found your answer.

If the arcade and bouncy castle are full, there are 14 people in those rooms. There are 16 people left (30 -14 = 16). If the same number of people should be in the swimming pool and basketball court, then 8 people should be in each room because 16 ÷ 2 = 8.

Will the carpool work? Arianna plans a carpool using 6 vans to help her friends get to the party. All the friends, including Arianna, ride in the vans. How many people attending the party will need to fit in each van, if each van has the same number of people? Write and solve a multiplication or division equation that represents Arianna's carpool problem. Be sure to use a letter in your equation. Explain how you solved your equation.

Multiplication: $6 \times p = 30$ *OR Division:* $30 \div 6 = p$

I know that 5 times 6 equals 30 and that's the same as 6 times 5, so there would need to be 5 people in each van.

**Other work or explanations are possible.*

A prize for Arianna: Five of Arianna's friends decide to use the tickets they won in the arcade to get a prize for Arianna. Each friend has won 8 tickets so far. The prize they want to get, a pink purse, costs 90 tickets. How many more tickets must each friend win in order to be able to get the prize?

$5 \times 8 = 40$ *The 5 friends have a total of 40 tickets.*

$90 - 40 = 50$ *The 5 friends need to get 50 more tickets to be able to get the prize.*

$50 \div 5 = 10$ *Each friend needs to get 10 more tickets.*

Making sense of her presents: Arianna had a great birthday party and received 44 gifts at the party. All of her friends brought either 1 or 2 gifts.

a. If all of her friends gave her at least 1 gift, how many gave her 2 gifts?

   $44 - 29 = 15$ *There were 15 friends who gave Arianna two gifts.*

b. When she distributed thank-you cards to all 29 friends at school on Monday, 5 friends said they forgot to give her their gift. After learning this, how many friends gave Arianna 2 gifts? Show how you found your answers using drawings or equations.

   If 5 people forgot to give her gifts, then only 24 friends gave her gifts, so $44 - 24 = 20$*. That means 20 people gave Arianna two gifts.*

Bobby's Field Day (IT)

Overview

The students will use multiplication and division to determine how many activities they can participate in for Field Day.

Standards

Represent and solve problems involving multiplication and division.

3.OA.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*.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.OA.A.2	• 3.OA.A.1	1. Write a story problem that could be represented by $63 \div 7 = 9$. a. Mandy has 63 pieces of candy that she is putting into 7 bags. There will be 9 pieces of candy in each bag. 2. http://www.illustrativemathematics.org/illustrations/1531 3. http://www.illustrativemathematics.org/illustrations/1540	• http://learnzillion.com/lessonsets/299-interpreting-wholenumber-quotients-of-whole-numbers • http://learnzillion.com/lessonsets/91-interpret-wholenumber-quotients-of-whole-numbers

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a field day?** A school day for classes to participate in various activities that could take place outside.

During the Task:

The students may come up with a variety of expressions for problem 3 of this task. The students must use all 24 tickets with one station and be able to explain the expression. Either provide students with copies of the tickets included in this task or provide real tickets as manipulatives.

After the Task:

The students can share their answers to problem 3 with the class to create a master list. The teacher can allow students to create various expressions using tickets and stations listed.

Have students apply these concepts to other situations like determining how many cookies each student can get if the class is given a set number of cookies or how many minutes each person can spend at a particular ride if each person in the class goes on the ride once and the class has a total of 30 minutes to ride.

Student Instructional Task

Bobby's class has earned a field day. The table below shows the field day stations and the number of tickets needed to visit each station.

Field Day Activities

Station	Number of Tickets
Bouncy House	6
Basketball	2
Bubbles	3
Face Painting	4
Relay Races	8

1. Bobby visited the bouncy house. He used a total of 12 tickets.
    a. Explain what the equation 12 ÷ 2 = 6 represents in terms of Bobby's visit to the bouncy house.

    b. Write an equation with a quotient of 2 using any of the activities listed in the table. Explain what the equation represents.

2. Using the information in the table, describe an activity at the field day that would be represented by the expression 18 ÷ 3 = 6.

3. Create an equation using a total of 24 tickets and **one** of the stations from the table. Tell how many times you could visit that station if you used all 24 tickets with no tickets left over. Explain what the equation represents.
    a. Write the equation.

    b. How many times could you visit the station?

    c. What does the equation represent?

Use this page to create tickets for students.

1 ticket	1 ticket	1 ticket	1 ticket	1 ticket
1 ticket	1 ticket	1 ticket	1 ticket	1 ticket
1 ticket	1 ticket	1 ticket	1 ticket	1 ticket
1 ticket	1 ticket	1 ticket	1 ticket	1 ticket
1 ticket	1 ticket	1 ticket	1 ticket	1 ticket
1 ticket	1 ticket	1 ticket	1 ticket	1 ticket

Instructional Task Exemplar Response

Bobby's class has earned a field day. The table below shows the field day stations and the number of tickets needed to visit each station.

Field Day Activities

Station	Number of Tickets
Bouncy House	6
Basketball	2
Bubbles	3
Face Painting	4
Relay Races	8

1. Bobby visited the bouncy house. He used a total of 12 tickets
    a. Explain what the equation 12 ÷ 2 = 6 represents in terms of Bobby's visit to the bouncy house.

    12 represents the number of total tickets, 2 is the number of times Bobby went to the bouncy house, and 6 is the number of tickets each visit cost.

    b. Write an equation with a quotient of 2 using any of the activities listed in the table. Explain what the equation represents.

    ***Note: Many answers can be accepted here as long as the quotient is 2.*

    Sample responses: 12 ÷ 6 = 2; 12 represents the number of total tickets, 6 is the number of tickets each visit cost, and 2 is the number of times Bobby went to the bouncy house.

    6 ÷ 3 = 2; 6 represents the number of total tickets, 3 is the number of tickets each visit cost, and 2 is the number of times Bobby went to the bubbles.

    8 ÷ 4 = 2; 8 represents the total number of tickets, 4 represents the number of tickets needed for each visit to face painting, and 2 represents the number of times Bobby went to face painting.

2. Using the information in the table, describe an activity at the field day that would be represented by the expression 18 ÷ 3 = 6.

    Sample Situations:

    Bobby can visit the bouncy house 3 times. A total of 18 tickets divided by 3 visits, which gave me 6 tickets spent each visit. That is the number of tickets needed for each visit to the bouncy house.

    Bobby can visit the bubbles 6 times. A total of 18 tickets divided by 6 visits, which gave me a total of 3 tickets spent each visit. That is the number of tickets needed for each visit to the bubbles.

3. Create an equation using a total of 24 tickets and **one** of the stations from the table. Tell how many times you could visit that station if you used all 24 tickets with no tickets left over. Explain what the equation represents.

   ***Note: Many responses can be accepted here.*

   a. Write the equation.

      Sample response: 24 ÷ 8 = 3

   b. How many times could you visit the station?

      Sample response: I could visit it 3 times because 24 ÷ 8= 3

   c. What does the equation represent?

      Sample response: If I use all 24 tickets at the relay races station and divide 24 by 8, which is the cost of 1 visit.

Five Sisters Running a Race (IT)

Overview

Students will locate fractions on a number line, identify equivalent fractions, and compare fractions that have the same numerator or the same denominator.

Standards

Developing understanding of fractions as numbers.

3.NF.A.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

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

b. Represent a fraction *a*/*b* on a number line diagram by marking of *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.

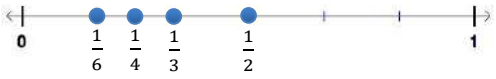
3.NF.A.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are only valid 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.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.NF.A.2	• 2.MD.B.6	1. Draw points on the number line for $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{6}$.  2. http://www.illustrativemathematics.org/illustrations/168 3. http://www.illustrativemathematics.org/illustrations/169 4. http://www.illustrativemathematics.org/illustrations/172	• http://www.illustrativemathematics.org/illustrations/1081 • http://learnzillion.com/lessonsets/334-represent-fractions-on-a-number-line • http://learnzillion.com/lessonsets/80-fractions-on-number-lines

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
3.NF.A.3	• 3.NF.A.1 • 3.NF.A.2	1. Marco ate $\frac{2}{3}$ of a pizza. Robert ate $\frac{2}{8}$ of the same pizza. Did Marco or Robert eat more pizza? a. Marco ate more pizza. 2. http://www.illustrativemathematics.org/illustrations/871 3. http://www.illustrativemathematics.org/illustrations/1353 4. http://www.illustrativemathematics.org/illustrations/1354 5. http://www.illustrativemathematics.org/illustrations/1356	• http://www.illustrativemathematics.org/illustrations/833 • http://www.illustrativemathematics.org/illustrations/168 • http://www.illustrativemathematics.org/illustrations/171 • http://www.illustrativemathematics.org/illustrations/173 • http://www.illustrativemathematics.org/illustrations/172 • http://learnzillion.com/lessonsets/335-understand-equivalent-fractions • http://learnzillion.com/lessonsets/337-compare-fractions-with-the-same-numerator-and-denominator

During the Task:

- Students will need to use some type of measurement tool to be able to divide the number lines into equal pieces to locate the fractions correctly. Students may use traditional tools such as inch rulers or nontraditional tools such as inch unit cubes. If necessary, adjust the number lines to fit the manipulatives or measurement tools provided for the students.
- As students compare the fractions, students can use the first set of number lines to help determine their answers to questions 2 through 4. Encourage students to use different colors when showing the locations of two sisters on one number line so they can see the different lengths for each fraction.
- When comparing fractions without a number line provided, encourage students to draw other pictures and use the size of the fractions in their drawings to answer the questions. Remind students that the pictures they draw to represent the whole must be the same size. A good tool to help with creating drawings to compare fractions is grid paper.

- Pause periodically throughout the task to give students time to discuss their answers with a partner and as a whole class. This will provide an opportunity for all students to hear the strategies and general thinking of their peers. This will give them more information and knowledge as they attempt the later parts of the task.

After the Task:

Provide students with additional practice locating fractions on a number line. Students should be able to locate fractions that are less than one as well as fractions that are greater than one on the number line using the same strategies in this task. Provide additional practice with comparing fractions with the same numerator or the same denominator and have students provide drawings or number lines to support their reasoning.

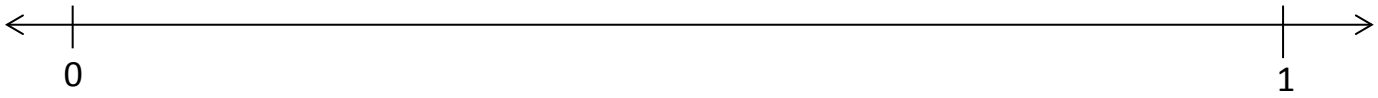
Student Instructional Task

Five sisters are training for a race. The fractions listed below tell the fraction of a mile each sister completed in 10 minutes.

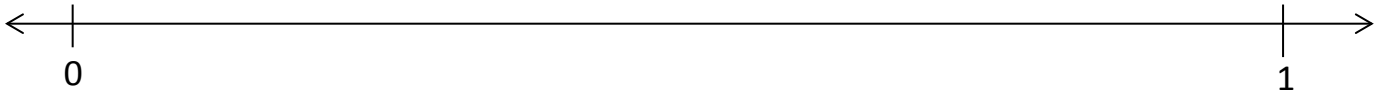
Sister	Fraction of a Mile Completed in 10 minutes
Elizabeth	$\frac{1}{2}$ mile
Laney	$\frac{1}{4}$ mile
Aliyah	$\frac{1}{8}$ mile
Jade	$\frac{1}{6}$ mile
Quin	$\frac{2}{4}$ mile

1. Show what fraction of a mile each sister completed by locating the fraction on the number lines below. Be as precise as possible when locating and marking each fraction on the number lines.

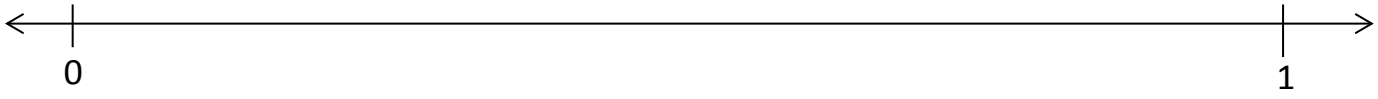
Elizabeth



Laney



Aliyah

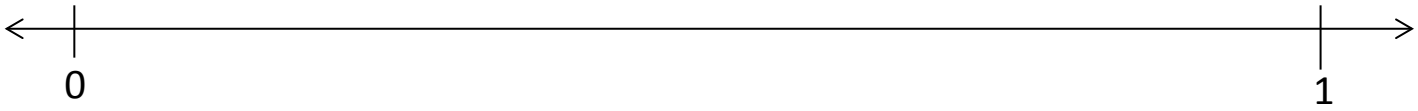


Jade

Quin

2. Compare the fraction for Elizabeth's distance to the fraction for Laney's distance. Who completed more of a mile in 10 minutes? Show how you know you are correct by showing both fractions on the number line below. Be as precise as possible when locating and marking each fraction on the number line.

3. Compare the fraction for Aliyah's distance to the fraction for Jade's distance. Who completed more of a mile in 10 minutes? Show how you know you are correct by showing both fractions on the number line below. Be as precise as possible when locating and marking each fraction on the number line.



4. Which of the four sisters, Elizabeth, Laney, Aliyah, or Jade, completed the greatest fraction of a mile in 10 minutes? Explain how you know.

5. Which of the sisters completed the same distance? How do you know? Use drawings to show your thinking.

On the day of the race, a friend recorded the distance each sister completed in 20 minutes. The table below lists the fraction of a mile each sister completed in 20 minutes.

Sister	Fraction of a Mile Completed in 20 minutes
Elizabeth	$\frac{6}{8}$ mile
Laney	$\frac{2}{4}$ mile
Aliyah	$\frac{5}{8}$ mile
Jade	$\frac{5}{6}$ mile
Quin	$\frac{3}{3}$ mile

6. Did Quin or Aliyah complete more of a mile in 20 minutes? How do you know? Use > or < to show your comparison.

7. Did Aliyah or Jade complete more of a mile in 20 minutes? How do you know? Use > or < to show your comparison.

8. Which sister was able to complete 1 mile in 20 minutes? How do you know?

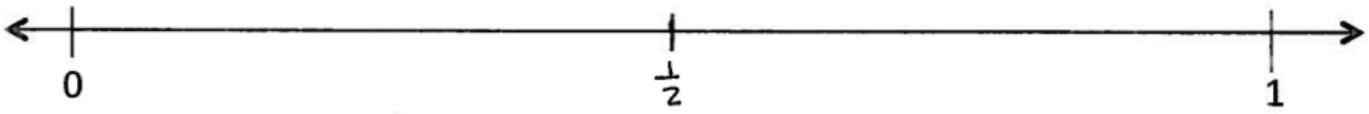
Instructional Task Exemplar Response

Five sisters are training for a race. The fractions listed below tell the fraction of a mile each sister completed in 10 minutes.

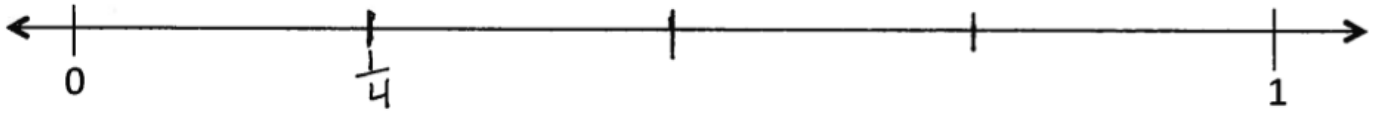
Sister	Fraction of a Mile Completed in 10 minutes
Elizabeth	$\frac{1}{2}$ mile
Laney	$\frac{1}{4}$ mile
Aliyah	$\frac{1}{8}$ mile
Jade	$\frac{1}{6}$ mile
Quin	$\frac{2}{4}$ mile

1. Show what fraction of a mile each sister completed by locating the fraction on the number lines below. Be as precise as possible when locating and marking each fraction on the number lines.

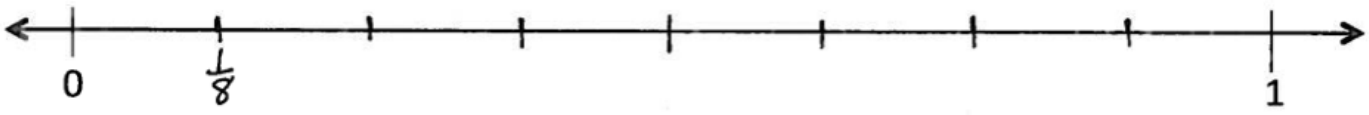
Elizabeth



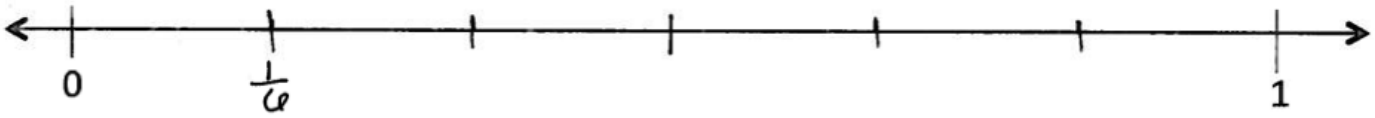
Laney



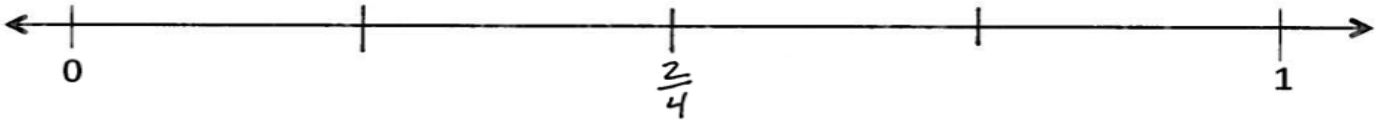
Aliyah



Jade

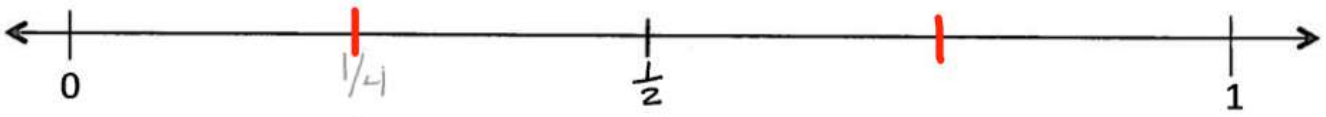


Quin



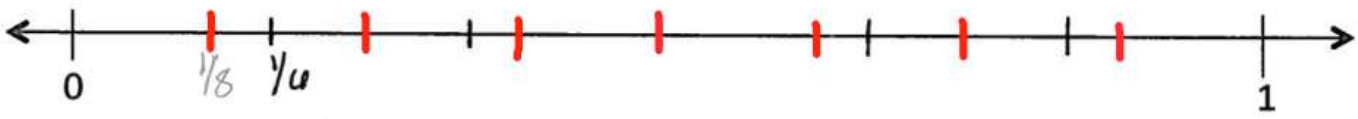
2. Compare the fraction for Elizabeth's distance to the fraction for Laney's distance. Who completed more of a mile in 10 minutes? Show how you know you are correct by showing both fractions on the number line below. Be as precise as possible when locating and marking each fraction on the number line.

   Elizabeth completed more of a mile in 10 minutes than Laney. When the two fractions are shown on the number line, $\frac{1}{2}$ is closer to 1 than $\frac{1}{4}$, so $\frac{1}{2}$ mile is more than $\frac{1}{4}$ mile.



3. Compare the fraction for Aliyah's distance to the fraction for Jade's distance. Who completed more of a mile in 10 minutes? Show how you know you are correct by showing both fractions on the number line below. Be as precise as possible when locating and marking each fraction on the number line.

   Jade completed more of a mile in 10 minutes than Aliyah. When the two fractions are shown on the number line, $\frac{1}{6}$ is closer to 1 than $\frac{1}{8}$, so $\frac{1}{6}$ mile is more than $\frac{1}{8}$ mile.

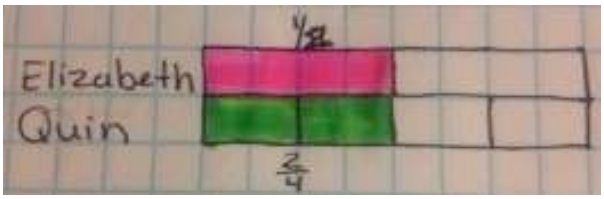


4. Which of the four sisters, Elizabeth, Laney, Aliyah, or Jade, completed the greatest fraction of a mile in 10 minutes? Explain how you know.

   Elizabeth completed the greatest fraction of a mile in 10 minutes because $\frac{1}{2}$ is the greatest fraction of the four sisters. I know that $\frac{1}{2}$ is the greatest because when I divide one whole into equal pieces each time I create more equal pieces, the smaller the pieces become. So when I divide a whole into 4 equal pieces, each $\frac{1}{4}$ is smaller than $\frac{1}{2}$. When I divide the same whole into 6 equal pieces, $\frac{1}{6}$ is smaller than $\frac{1}{2}$ too. If I divide the same whole into 8 equal pieces, $\frac{1}{8}$ is smaller than $\frac{1}{2}$.

5. Which of the sisters completed the same distance? How do you know? Use drawings to show your thinking.

   Quin and Elizabeth ran the same distance because $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent fractions. I know they are equivalent because they are the same size.



On the day of the race, a friend recorded the distance each sister completed in 20 minutes. The table below lists the fraction of a mile each sister completed in 20 minutes.

Sister	Fraction of a Mile Completed in 20 minutes
Elizabeth	$\frac{6}{8}$ mile
Laney	$\frac{2}{4}$ mile
Aliyah	$\frac{5}{8}$ mile
Jade	$\frac{5}{6}$ mile
Quin	$\frac{3}{3}$ mile

6. Did Quin or Aliyah complete more of a mile in 20 minutes? How do you know? Use > or < to show your comparison.

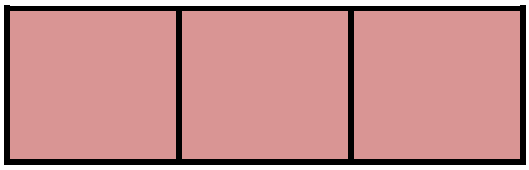
   Quin completed more of a mile than Aliyah in 20 minutes because $\frac{6}{8} > \frac{5}{8}$. Since both fractions have the same denominator and both fractions are of the same whole (one mile), the size of each piece when the whole is divided will be the same. 6 pieces are more than 5 pieces, when the size of the pieces is the same.

7. Did Aliyah or Jade complete more of a mile in 20 minutes? How do you know? Use > or < to show your comparison.

   Jade completed more of a mile in 20 minutes than Aliyah because $\frac{5}{8} < \frac{5}{6}$. I know this is true because $\frac{1}{6}$ of a mile is a longer distance than $\frac{1}{8}$ of a mile. If I have 5 pieces that are $\frac{1}{6}$ size, that will be bigger than 5 pieces that are $\frac{1}{8}$ size.

8. Which sister was able to complete 1 mile in 20 minutes? How do you know?

   Elizabeth completed 1 mile because $\frac{3}{3}$ is equal to 1. If I divide a whole into three equal parts and shade 3 of those parts, the whole figure will be shaded.



4TH GRADE TOOLS

4TH GRADE TOOLS

4th Grade Remediation Guide

As noted in "Remediation" on page 12 isolated remediation helps target the skills students need to more quickly access and practice on-grade level content. This chart is a reference guide for teachers to help them more quickly identify the specific remedial standards necessary for every fourth grade math standard[6].

4th Grade Standard	Previous Grade Standards	4th Gr. Stand. Taught in Advance	4th Gr. Stand. Taught Concurrently
4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.	• 3.OA.A.1 • 3.OA.A.3		
4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.	• 3.OA.A.3	• 4.OA.A.1	• 4.MD.A.1
4.OA.A.3 ***(no judging reasonableness)*** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	• 3.OA.D.8	• 4.NBT.A.3	
4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.		• 4.OA.A.3 *(no judging reasonableness)* • 4.NBT.B.6	• 4.MD.A.2
4.OA.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.	• 3.OA.C.7		

[6] This content comes from the work of the math standards' authors found here: http://www.edutron.com/0/Math/ccssmgraph.htm

4th Grade Standard	Previous Grade Standards	4th Gr. Stand. Taught in Advance	4th Gr. Stand. Taught Concurrently
4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*	• 3.OA.D.9		
4.NBT.A.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*	• 2.NBT.A.1		
4.NBT.A.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.		• 4.NBT.A.1	
4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place.	• 3.NBT.A.1	• 4.NBT.A.1 • 4.NBT.A.2	
4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	• 3.NBT.A.2	• 4.NBT.A.1	
4.NBT.B.5 (no two-digit by two-digit) Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	• 3.NBT.A.2 • 3.OA.B.5 • 3.NBT.A.3 • 3.OA.C.7	• 4.NBT.A.1	
4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.		• 4.NBT.B.5 *(no two-digit by two-digit)*	
4.NBT.B.6 (no four-digit dividends) Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	• 3.NBT.A.2 • 3.OA.B.5 • 3.OA.C.7	• 4.NBT.A.1	
4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.		• 4.NBT.B.5 • 4.NBT.B.6 *(no four-digit dividends)*	

4th Grade Standard	Previous Grade Standards	4th Gr. Stand. Taught in Advance	4th Gr. Stand. Taught Concurrently
4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	• 3.NF.A.3	• 4.OA.A.2	
4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. 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.		• 4.NF.A.1	
4.NF.B.3a-c Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: ⅜ = ⅛ + ⅛ + ⅛ ; ⅜ = ⅛ + ⅔ ; 2⅛ = 1 + 1 + ⅛ = ⅝ + ⅝ + ⅛.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.	• 3.NF.A.1 • 1.OA.B.3 • 1.OA.B.4 • 2.OA.A.1 *(two-step and harder one-step)* • 3.NF.A.2	• 4.NF.A.1	
4.NF.B.3d d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.	• 1.OA.D.8	• 4.NF.B.3a-c	• 4.MD.A.2 • 4.MD.B.4
4.NF.B.4a Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction *a/b* as a multiple of $1/b$. *For example, use a visual fraction model to represent ⅝ as the product 5 × (⅛), recording the conclusion by the equation ⅝ = 5 × (⅛).*	• 3.OA.A.1 • 3.NF.A.1	• 4.OA.A.2	• 4.NF.B.4c
4.NF.B.4b Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (⅖) as 6 × (⅕), recognizing this product as ⅚. (In general, n × (a/b) = (n × a)/b.)*		• 4.NF.B.4a	• 4.NF.B.4c

4th Grade Standard	Previous Grade Standards	4th Gr. Stand. Taught in Advance	4th Gr. Stand. Taught Concurrently
4.NF.B.4c Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat ⅜ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*	• 3.OA.A.3		• 4.NF.B.4a • 4.NF.B.4b
4.NF.C.5 d. 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[2] *For example, express ³⁄₁₀ as ³⁰⁄₁₀₀, and add ³⁄₁₀ + ⁴⁄₁₀₀ = ³⁴⁄₁₀₀.*		• 4.NF.A.1 • 4.NF.B.3a-c	
4.NF.C.6 Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as ⁶²⁄₁₀₀; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*		• 4.NF.C.5	
4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.		• 4.NF.A.2 • 4.NF.C.6	
4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*	• 3.OA.C.7 • 3.MD.A.2		• 4.OA.A.2
4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.		• 4.NF.B.3a-c • 4.NF.B.4c • 4.NF.C.5 • 4.NF.C.6 • 4.MD.A.1	• 4.OA.A.3 • 4.NF.B.3d
4.MD.A.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*	• 3.OA.A.4 • 3.MD.C.7b • 3.MD.D.8		

4th Grade Standard	Previous Grade Standards	4th Gr. Stand. Taught in Advance	4th Gr. Stand. Taught Concurrently
4.MD.B.4 Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*	• 3.MD.B.4		• 4.NF.B.3d
4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through ⅓₆₀ of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of n degrees.			• 4.G.A.1 • 4.G.A.2
4.MD.C.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.		• 4.MD.C.5	
4.MD.C.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.	• 1.OA.D.8	• 4.MD.C.5	
4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	• 3.G.A.1		• 4.MD.C.5
4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.		• 4.G.A.1	• 4.MD.C.5
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	• 1.G.A.2		

4th Grade Tasks At a Glance

There are 10 sample tasks included in this guidebook that can be used to supplement any curriculum.

The tasks for fourth grade include:

- **5 Extended Constructed Response (ECR):** These short tasks, aligned to the standards, mirror the extended constructed response items students will see on their end of year state assessments.
- **5 Instructional Tasks (IT):** These complex tasks are meant to be used for instruction and assessment. They will likely take multiple days for students to complete. They can be used to help students explore and master the full level of rigor demanded by the standards. Teachers can use the table below to find standards associated with current instruction and add in these practice items to supplement any curriculum. These tasks should be used after students have some initial understanding of the standard. They will help students solidify and deepen their understanding of the associated content.

This is an overview of the fourth grade tasks included on the following pages.

Title	Type	Task Standards	Task Remedial Standards
Distance Traveled Page 101	ECR	• 4.NBT.B.4 • 4.NBT.B.5 • 4.NBT.B.6	• 3.NBT.A.2 • 3.NBT.A.3 • 3.OA.B.5 • 3.OA.C.7 • 4.NBT.A.1
Birthday Party Food Page 107	ECR	• 4.NF.A.2 • 4.NF.B.3	• 3.NF.A.2 • 3.NF.A.1 • 4.NF.A.1
Big Ben's Bakery Page 111	ECR	• 4.OA.A.1 • 4.OA.A.2 • 4.OA.A.3	• 3.OA.A.1 • 3.OA.A.3 • 3.OA.D.8 • 4.NBT.A.3
School Store Page 117	ECR	• 4.OA.A.2 • 4.OA.A.3	• 3.OA.A.3 • 3.OA.D.8 • 4.NBT.A.3
Alien Contest Page 121	ECR	• 4.OA.B.4	• 3.OA.C.7
Card Game Page 126	IT	• 4.NBT.A.2	• 4.NBT.A.1

Title	Type	Task Standards	Task Remedial Standards
Event Signs Page 134	IT	• 4.NF.B.4a • 4.NF.B.4c • 4.MD.A.3	• 3.OA.A.1 • 3.OA.A.3 • 3.OA.A.4 • 3.NF.A.1 • 3.MD.C.7b • 3.MD.D.8 • 4.OA.A.2
Teachers Appreciation Week Page 142	IT	• 4.NF.B.4c	• 3.OA.A.3
Dollars and Cents Page 148	IT	• 4.NF.C.5 • 4.NF.C.6 • 4.NF.C.7	• 4.NF.A.1 • 4.NF.B.3a-c • 4.NF.C.2
Class Picnic Page 155	IT	• 4.OA.A.3 • 4.OA.B.4	• 3.OA.C.7 • 3.OA.D.8 • 4.NBT.A.3

Distance Traveled (ECR)

Overview

Students will use the four operations on multi-digit whole numbers to answer questions about traveling to different cities in Louisiana.

Standards

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

4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply 2 two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NBT.B.4	• 3.NBT.A.2 • 4.NBT.A.1	1. Add 534 + 251 + 169. a. 954 2. Subtract 641 – 299. a. 342	• http://learnzillion.com/lessonsets/622-add-and-subtract-using-the-standard-algorithm
4.NBT.B.5	• 3.NBT.A.2 • 3.NBT.A.3 • 3.OA.B.5 • 3.OA.C.7 • 4.NBT.A.1	1. Multiply 265 x 6. a. 1,590 2. Multiply 1,528 x 4. a. 6,112	• http://www.illustrativemathematics.org/illustrations/1445 • http://learnzillion.com/lessonsets/360-multiply-multidigit-whole-numbers • http://learnzillion.com/lessonsets/3-solve-multiplication-problems
4.NBT.B.6	• 3.NBT.A.2 • 3.OA.B.5 • 3.OA.C.7	1. Divide 1162 ÷ 7. a. 166 2. Divide 1624 ÷ 6. a. 270 with a remainder of 4 3. http://www.illustrativemathematics.org/illustrations/1774	• http://learnzillion.com/lessonsets/260-find-whole-number-quotients-and-remainders-with-up-to-fourdigit-dividends

After the Task

For problem 2, students may only add the two values given in the problem. Have them read the problem again and create a list to organize the information given. Students will need to use the table provided at the beginning to find the distances for the first and last legs of the trip. Some students may struggle if they try to add all four distances at the same time. Have students complete the work by adding the first two distances, then adding the third distance to their result, and so on. Be sure students are not using a string of equal signs that do not make sense (e.g., 271 + 239 = 510 + 284 = 794 + 187 = 981).

For problem 3, students may forget to multiply 80 by 2 (or add 80 + 80) to find the total distance Rachel drives each day. Have students read the problem again and ask them what the phrase "back and forth" means. Have students figure out how far Rachel drives on one day. Provide additional practice with multistep word problems involving multiplication. Also, students can use the standard algorithm to solve this problem, although it is not required to be mastered in grade 4. The intent of 4.NBT.B.5 is to have students use strategies that demonstrate an understanding of place value rather than building fluency with the algorithm.

For problem 4, students can use the standard algorithm, although it is not required to be mastered in grade 4. The intent of 4.NBT.B.5 is to have students use strategies that demonstrate an understanding of place value rather than building fluency with the algorithm. Guide students to use the relationship between multiplication and division to find the number one would multiply by 6 to get to 1,146. Ask students to identify multiplication facts involving 6 that could be helpful in finding the unknown factor. Have students use place value to find products that would get them close to the final product of 1146. Connect the work with multiplication and place value to the standard algorithm.

Student Extended Constructed Response

Distance (in miles) from Baton Rouge, LA

City, State	Distance One Way (in miles)
Alexandria, LA	126
Birmingham, AL	399
Bossier City, LA	250
Houston, TX	271
Monroe, LA	187
Nashville, TN	587
New Orleans, LA	80
Orlando, FL	695

The chart above lists the one-way distance to travel by car from Baton Rouge, Louisiana, to various cities in the southern region of the United States. Use the chart to answer questions 1-3.

1. How much farther is it to drive from Baton Rouge, LA, to Orlando, FL, than it is to drive from Baton Rouge, LA, to Birmingham, AL? Show your work.

2. On Monday morning, Gunther left Baton Rouge, LA, for Houston, TX. On Tuesday, Gunther drove from Houston, TX, to Dallas, TX, which is 239 miles. On Thursday, he left Dallas, TX, and drove to Monroe, LA, which is 284 miles. On Friday, Gunther returned to Baton Rouge, LA, from Monroe, LA. How many miles did Gunther drive in all? Show how you found your answer.

3. Rachel works in New Orleans, LA, but lives in Baton Rouge, LA. She drives back and forth to work 5 days each week. How many miles does she drive going back and forth to work each week? Use equations, arrays, and/or area models to show how you arrived at your answer.

4. Roland is moving from Baton Rouge, LA, to Philadelphia, PA. He is driving his car to his new home, which is 1,146 miles away. He has 6 days to get to his new house before the movers arrive with his belongings. If Roland wants to drive the same distance each day, how far should he drive each day to arrive in Philadelphia on day 6? Show or explain how you found your answer.

Extended Constructed Response Exemplar Response

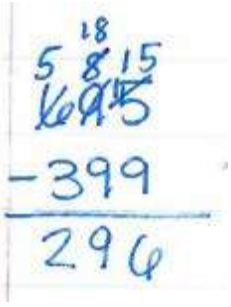
Distance (in miles) from Baton Rouge, LA

City, State	Distance One Way (in miles)
Alexandria, LA	126
Birmingham, AL	399
Bossier City, LA	250
Houston, TX	271
Monroe, LA	187
Nashville, TN	587
New Orleans, LA	80
Orlando, FL	695

The chart above lists the one-way distance to travel by car from Baton Rouge, LA, to various cities in the southern region of the United States. Use the chart to answer questions 1-3.

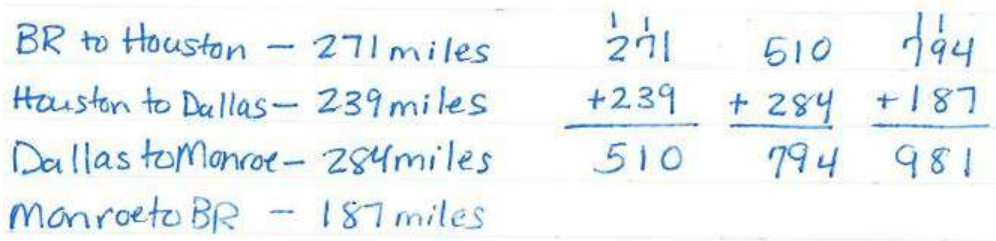
1. How much farther is it to drive from Baton Rouge, LA, to Orlando, FL, than it is to drive from Baton Rouge, LA, to Birmingham, AL? Show your work.

   It is 296 miles farther to Orlando than to Birmingham from Baton Rouge.



2. On Monday morning, Gunther left Baton Rouge, LA, for Houston, TX. On Tuesday, Gunther drove from Houston, TX, to Dallas, TX, which is 239 miles. On Thursday, he left Dallas, TX, and drove to Monroe, LA, which is 284 miles. On Friday, Gunther returned to Baton Rouge, LA, from Monroe, LA. How many miles did Gunther drive in all? Show how you found your answer.

   Gunther drove a total of 981 miles.



3. Rachel works in New Orleans, LA, but lives in Baton Rouge, LA. She drives back and forth to work 5 days each week. How many miles does she drive going back and forth to work each week? Use equations, arrays, and/or area models to show how you arrived at your answer.

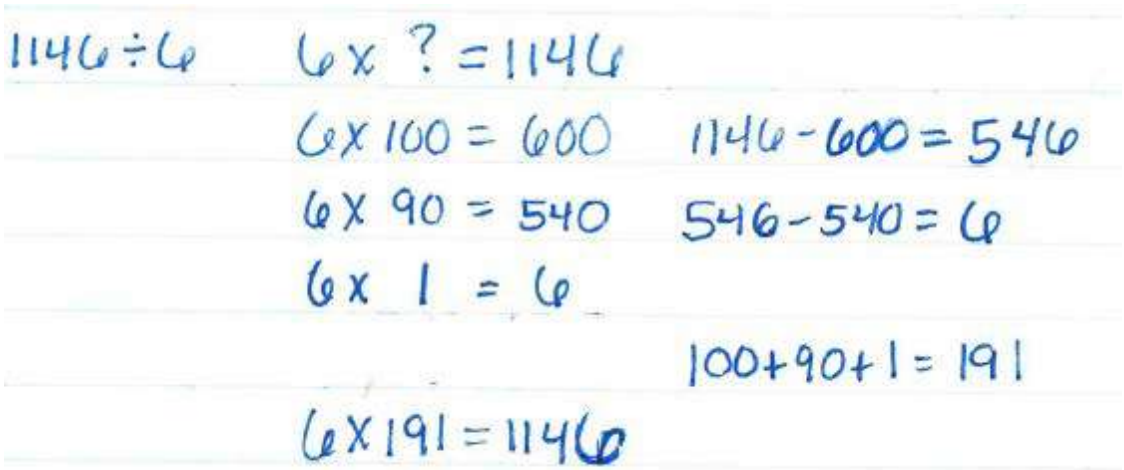
   Rachel drives 160 miles each day because 80 + 80 = 160. If she drives 5 days each week, then she drives 160 x 5.

   $160 \times 5 = (100 + 60) \times 5 = (5 \times 100) + (5 \times 60) = 500 + 300 = 800$

   Rachel drives 800 miles each week.

4. Roland is moving from Baton Rouge, LA, to Philadelphia, PA. He is driving his car to his new home, which is 1,146 miles away. He has 6 days to get to his new house before the movers arrive with his belongings. If Roland wants to drive the same distance each day, how far should he drive each day to arrive in Philadelphia on day 6? Show or explain how you found your answer.

   Roland should drive 191 miles per day to arrive in Philadelphia on day 6.



Birthday Party Food (ECR)

Overview

Students will compare, add, and subtract fractions to answer questions about the food at a birthday party.

Standards

Extend understanding of fraction equivalence and ordering.

4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the result of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

4.NF.B.3 Understand a fraction a/b with a > 1 as a sum of fractions 1/b.

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NF.A.2	• 4.NF.A.1	1. Compare $\frac{2}{5}$ to $\frac{4}{8}$ using >, =, or <. a. $\frac{2}{5} < \frac{4}{8}$ 2. Compare $\frac{2}{3}$ to $\frac{4}{9}$ using >, =, or <. a. $\frac{2}{3} > \frac{4}{9}$ 3. http://www.illustrativemathematics.org/illustrations/812 4. http://www.illustrativemathematics.org/illustrations/811	• http://www.illustrativemathematics.org/illustrations/743 • http://www.illustrativemathematics.org/illustrations/881 • http://learnzillion.com/lessonsets/220-compare-fractions-by-creating-common-denominators-or-numerators-2 • http://learnzillion.com/lessonsets/177-compare-fractions-using-a-benchmark-fraction • http://learnzillion.com/lessonsets/176-compare-fractions-by-creating-common-denominators-or-numerators • http://learnzillion.com/lessonsets/7-compare-fractions-of-different-types

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NF.B.3	• 3.NF.A.2 • 3.NF.A.1 • 4.NF.A.1	1. Add $\frac{4}{5} + \frac{2}{5}$. a. $\frac{6}{5}$ or $1\frac{1}{5}$ 2. Add $3\frac{2}{3} + 2\frac{2}{3}$ a. $6\frac{1}{3}$ 3. Subtract $\frac{7}{8} - \frac{4}{8}$. a. $\frac{3}{8}$ 4. http://www.illustrativemathematics.org/illustrations/831 5. http://www.illustrativemathematics.org/illustrations/835 6. http://www.illustrativemathematics.org/illustrations/968	• http://www.illustrativemathematics.org/illustrations/833 • http://www.illustrativemathematics.org/illustrations/168 • http://www.illustrativemathematics.org/illustrations/171 • http://www.illustrativemathematics.org/illustrations/173 • http://www.illustrativemathematics.org/illustrations/169 • http://learnzillion.com/lessonsets/312-understand-addition-and-subtraction-of-fractions-and-decomposing-fractions-2 • http://learnzillion.com/lessonsets/290-understand-addition-and-subtraction-of-fractions-and-decomposing-fractions-1 • http://learnzillion.com/lessonsets/343-add-and-subtract-mixed-numbers-with-like-denominators • http://learnzillion.com/lessonsets/178-add-and-subtract-mixed-numbers-with-like-denominators • http://learnzillion.com/lessonsets/82-add-subtract-and-compare-fractions

After the Task

Students who have trouble comparing fractions with different denominators should be encouraged to draw fraction models to help them make the comparison. Remind students that the models they draw must have the same-size whole to compare the fractional parts.

Students may struggle with problem 3 when subtracting mixed numbers. Discuss with students how they can change a whole number into a fraction. Have students make use of structure to see that mixed numbers like $4\frac{3}{8}$ can be rewritten as $4 + \frac{3}{8}$ or $\frac{8}{8} + \frac{8}{8} + \frac{8}{8} + \frac{8}{8} + \frac{3}{8}$. This creates improper fractions, eliminating the need to work with whole numbers and fractions separately. Another option might be to ask students if they can think of a way to rewrite the equation using addition.

Student Extended Constructed Response

1. Taylor and Amro celebrated their birthdays at the same party. They each had their own birthday cake. Each cake was the same size. After the party, $\frac{1}{2}$ of Taylor's cake was left. There was $\frac{5}{12}$ of Amro's cake left. Which cake had more left? Explain your reasoning.

2. Taylor and Amro decided to share a pizza during their party. Taylor ate $\frac{3}{6}$ and Amro ate $\frac{2}{6}$ of the pizza. How much of the pizza did they eat together? Show how you found your answer.

3. There are $4\frac{1}{8}$ pizzas left over from the birthday party. After Taylor and Amro gave some pizza to their friends, there were $2\frac{4}{8}$ pizzas left. Taylor thinks they gave $1\frac{3}{8}$ pizzas to friends. Do you agree with Taylor? Explain why you agree or disagree. Use equations or fraction models to support your explanation.

Extended Constructed Response Exemplar Response

1. Taylor and Amro celebrated their birthdays at the same party. They each had their own birthday cake. Each cake was the same size. After the party, $\frac{1}{2}$ of Taylor's cake was left. There was $\frac{5}{12}$ of Amro's cake left. Which cake had more left? Explain your reasoning.

   There is more of Taylor's cake left over. I know from creating equivalent fractions that $\frac{1}{2}$ is $\frac{6}{12}$, and $\frac{6}{12}$ is more than the $\frac{5}{12}$ that was left of Amro's cake.

2. Taylor and Amro decided to share a pizza during their party. Taylor ate $\frac{3}{6}$ and Amro ate $\frac{2}{6}$ of the pizza. How much of the pizza did they eat together? Show how you found your answer.

   The total amount of pizza they ate is $\frac{5}{6}$ of the whole pizza.
   $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$.

3. There are $4\frac{1}{8}$ pizzas left over from the birthday party. After Taylor and Amro gave some pizza to their friends, there were $2\frac{4}{8}$ pizzas left. Taylor thinks they gave $1\frac{3}{8}$ pizzas to friends. Do you agree with Taylor? Explain why you agree or disagree. Use equations or fraction models to support your explanation.

   I disagree with Taylor. If Taylor thinks that $1\frac{3}{8}$ pizzas were given to friends, then $1\frac{3}{8} + 2\frac{4}{8}$ should equal $4\frac{1}{8}$. Since $1\frac{3}{8} + 2\frac{4}{8} = 3\frac{7}{8}$ and not $4\frac{1}{8}$, Taylor cannot be correct.

   Alternative solution:
   I disagree with Taylor. They started with $4\frac{1}{8}$ pizzas and have $2\frac{4}{8}$ pizzas left.
   I can subtract $4\frac{1}{8} - 2\frac{4}{8}$ to find how much they gave away to friends.
   $4\frac{1}{8} = 4 \times \frac{8}{8} + \frac{1}{8} = \frac{32}{8} + \frac{1}{8} = \frac{33}{8}$ *and* $2\frac{4}{8} = 2 \times \frac{8}{8} + \frac{4}{8} = \frac{16}{8} + \frac{4}{8} = \frac{20}{8}$
   So $\frac{33}{8} - \frac{20}{8} = \frac{13}{8} = 1\frac{5}{8}$

   Taylor and Amro gave away $1\frac{5}{8}$ pizzas, not $1\frac{3}{8}$ pizzas.

Big Ben's Bakery (ECR)

Overview

Students will solve word problems involving multiplicative comparison and write statements of multiplicative comparison.

Standards

Use the four operations with whole numbers to solve problems.

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.OA.A.1	• 3.OA.A.1 • 3.OA.A.3	1. Write an equation that represents "56 is 8 times as many as 7." a. 56 = 8 x 7 2. There are 12 girls and 6 boys in the fourth-grade class. The equation 12 = 6 x 2 represents the number of girls compared to the number of boys. Write a sentence describing the comparison given by the equation. a. There number of girls is 2 times as many as the number of boys (or 12 is 2 times as many as 6).	• http://www.illustrativemathematics.org/illustrations/262 • http://learnzillion.com/lessonsets/539-interpret-multiplication-as-a-comparison

Grade-Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.OA.A.2	• 3.OA.A.3	1. Sarah raised $74 for the food bank last year. She raised 3 times as much money this year. How much money did she raise this year? a. $222 2. A rubber band is stretched to 12 cm. It is 4 times as long as its original length. How many centimeters long is its original length? a. 3 cm 3. http://www.illustrativemathematics.org/illustrations/263	• http://www.illustrativemathematics.org/illustrations/365 • http://learnzillion.com/lessonsets/615-solve-word-problems-using-multiplicative-comparisons
4.OA.A.3	• 3.OA.D.8 • 4.NBT.A.3	1. Alex brought 5 snacks to school to share with his class. Reagan brought 3 times as many snacks as Alex to share. How many snacks did Alex and Reagan bring in all? a. 20 snacks 2. http://www.illustrativemathematics.org/illustrations/1289	• http://www.illustrativemathematics.org/illustrations/13 • http://www.illustrativemathematics.org/illustrations/1301 • http://www.illustrativemathematics.org/illustrations/1807 • http://learnzillion.com/lessonsets/415-solve-multistep-word-problems-using-the-four-operations • http://learnzillion.com/lessonsets/352-solve-multistep-word-problems • http://learnzillion.com/lessonsets/47-assess-the-reasonableness-of-multiplication-and-division-answers

Real-World Preparation:

- **What is a dozen?** Some foods, like eggs and donuts, are sold by the dozen, which means there are 12 items in the group.

After the Task

Students may struggle with comparisons, such as the following: Bobby ate three times as many cookies as Ben; what operation is mentioned? This type of question is designed to help students compare numbers using multiplication. Provide additional practice with similar problems. Encourage students to draw models to find the amounts.

Students may struggle with generating comparisons in problem 3. Ask students to generate some examples of multiplicative comparisons. For example, there are half as many girls in our class as boys, or there are twice as many girls in our class as boys. If fractions have been introduced, question them about showing a fractional form. For example, Bobby ate $\frac{1}{3}$ more cookies than Ben.

For additional practice with the concepts in this task, have the class collect data about favorite items in different categories (type of pet, color, subject, etc.). Then have the students use the data to write multiplicative comparisons.

Student Extended Constructed Response

Big Ben's Bakery is a shop that sells cakes, cookies, donuts, and pastries. Answer each question and show your work.

1. The bakers at Big Ben's Bakery made 48 chocolate donuts, which is 6 times the number of cream-filled donuts they made.

    a. How many more chocolate donuts than cream-filled donuts did they make? Use an equation to show how you answered the question.

    b. How many dozens of chocolate donuts did they make?

2. Tess ordered three times as many cookies as Charles ordered and six times as many cookies as Shay ordered. The total number of cookies ordered by Tess is 36.

    a. How many cookies did Tess, Charles, and Shay order altogether? Use an equation to show how you solved the problem.

    b. How many more cookies did Tess order than Charles and Shay together?

3. Each year, the bakery has a donut-eating contest to see who can eat the most donuts. The chart below shows how many donuts each person ate during the contest.

Jaylan	Evie	Jake	Amon	Chris	Olivia	Jenny	Takaru
8	12	3	6	14	2	9	18

Based on the chart, Jaylan ate 4 times as many donuts as Olivia, which can be represented as 8 = 4 x 2.

Write three additional comparisons involving multiplication or division using the chart above. Write the three statements using words. Then write the equations that represent your statements.

Extended Constructed Response Exemplar Response

Big Ben's Bakery is a shop that sells cakes, cookies, donuts, and pastries. Answer each question and show your work.

1. The bakers at Big Ben's Bakery made 48 chocolate donuts, which is 6 times the number of cream-filled donuts they made.

    a. How many more chocolate donuts than cream-filled donuts did they make? Use an equation to show how you answered the question.

    48 = 6 x f f = 8; The bakers made 8 cream-filled donuts. (Students may use other equivalent equations to show their work.)

    48 - 8 = 40 The bakers made 40 more chocolate donuts than cream-filled donuts.

    b. How many dozens of chocolate donuts did they make?

    12 x d = 48

    d = 4

    The bakers made 4 dozen chocolate donuts.

2. Tess ordered three times as many cookies as Charles ordered and six times as many cookies as Shay ordered. The total number of cookies ordered by Tess is 36.

    a. How many cookies did Tess, Charles, and Shay order altogether? Use an equation to show how you solved the problem.

    Tess: 36 cookies

    Charles: $36 \div 3 = 12$ *or* $\frac{1}{3} \times 36 = 12$

    Shay: $36 \div 6 = 6$ *or* $\frac{1}{6} \times 36 = 6$

    36 + 12 + 6 = 54 They ordered 54 cookies altogether.

    ***Note: Students may use other equivalent equations to show their work.*

    b. How many more cookies did Tess order than Charles and Shay together?

    36 - (12+6)

    36 – 18

    18

    Tess ordered 18 more cookies than Charles and Shay together.

    ***Note: Correct answers based on incorrect work in Part a should be given credit.*

3. Each year, the bakery has a donut-eating contest to see who can eat the most donuts. The chart below shows how many donuts each person ate during the contest.

Jaylan	Evie	Jake	Amon	Chris	Olivia	Jenny	Takaru
8	12	3	6	14	2	9	18

Based on the chart, Jaylan ate 4 times as many donuts as Olivia, which can be represented as 8 = 4 x 2.

Write three additional comparisons involving multiplication or division using the chart above. Write the three statements using words. Then write the equations that represent your statements.

Answers will vary.

Some examples are:

- *Chris ate 7 times as many donuts as Olivia.* *7 x 2 = 14*
- *Evie ate 4 times as many donuts as Jake.* *12 = 4 x 3*
- *Takaru ate 2 times as many as donuts Jenny.* *9 x 2 = 18*
- *Jake ate 3 times fewer donuts than Jenny.* *9 ÷ 3 = 3*

School Store (ECR)

Overview

Students will solve word problems about sales at the school store involving the four operations.

Standards

Use the four operations with whole numbers to solve problems.

4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., using drawings or equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.OA.A.2	• 3.OA.A.3	1. There are 6 drinks in a box. There are 6 times as many drinks total as there are in one box. What is the total number of drinks? a. There are 36 drinks total. 2. Cory has 36 pieces of candy. Laura has 5 times as many pieces of candy as Cory. How many pieces of candy does Laura have? a. Laura has 180 pieces of candy. 3. http://www.illustrativemathematics.org/illustrations/263	• http://www.illustrativemathematics.org/illustrations/344 • http://www.illustrativemathematics.org/illustrations/365 • http://www.illustrativemathematics.org/illustrations/262 • http://learnzillion.com/lessonsets/615-solve-word-problems-using-multiplicative-comparisons
4.OA.A.3	• 3.OA.D.8 • 4.NBT.A.3	1. Cai was given $50 for her birthday. She added money that she had saved from her allowance to have a total of $80. If Cai receives $2 per week for her allowance, how many weeks did Cai save her allowance to have a total of $80? a. She saved her allowance for 15 weeks. 2. http://www.illustrativemathematics.org/illustrations/876 3. http://www.illustrativemathematics.org/illustrations/1289	• http://www.illustrativemathematics.org/illustrations/13 • http://www.illustrativemathematics.org/illustrations/1301 • http://www.illustrativemathematics.org/illustrations/1445 • http://learnzillion.com/lessonsets/415-solve-multistep-word-problems-using-the-four-operations

After the Task

For problem 2, students may round the answer up for the number of pencil boxes Mr. Green could buy. Have students check their work by multiplying the number of boxes they said could be bought and comparing their answer to the amount of money Mr. Green had to spend. Have students discuss why the answer they obtained is too much. Then have them figure out the greatest number of boxes Mr. Green can buy.

For problem 3, students may have difficulty with the multistep problem. Have students write down all of the information they know. Then have students identify what the question is asking them to find. If needed, have students organize the given information with a chart. Then ask students to discuss how they can find the missing amount. Have students think about smaller problems, for example, “James has $20. His mom gave him $5. His dad gave him the rest. How much did his dad give him?” to think about the operations needed to solve problem 3.

Student Extended Constructed Response

1. East Elementary School has had a school store for 5 years. West Elementary School has had a school store for eight times as many years as East Elementary School. How many years has West Elementary School had a school store? Show how you found your answer using an equation with a symbol to represent the unknown number.

   The prices for two of the items in the school store for each year are listed below. Use the table to answer questions 2 and 3.

Year	Pencil Box Price	Pack of Pencils Price
2010	$2.00	$1.00
2011	$2.50	$1.25
2012	$3.00	$1.50
2013	$3.50	$1.75

2. Mr. Green had $55.00 to spend in 2010. He bought 4 packs of pencils. What is the greatest number of pencil boxes Mr. Green was able to buy in 2010? Show your work or explain your reasoning.

3. The school store collected a total of $1,371 by selling pencil boxes in the years 2011 through 2013. In 2011, the amount collected for pencil boxes was $670. In 2013, the amount collected for pencil boxes was $119. How many pencil boxes were sold in 2012? Explain your reasoning or show how you found your answer.

Extended Constructed Response Exemplar Response

1. East Elementary School has had a school store for 5 years. West Elementary School has had a school store for eight times longer than East Elementary School. How many years has West Elementary School had a school store? Show how you found your answer using an equation with a symbol to represent the unknown number.

   $8 \times 5 = \square$

   $40 = \square$

   West Elementary School has had a school store for 40 years.

   The prices for two of the items in the school store for each year are listed below. Use the table to answer questions 2 and 3.

Year	Pencil Box Price	Pack of Pencils Price
2010	$2.00	$1.00
2011	$2.50	$1.25
2012	$3.00	$1.50
2013	$3.50	$1.75

2. Mr. Green had $55.00 to spend in 2010. He bought 4 packs of pencils. What is the greatest number of pencil boxes Mr. Green was able to buy in 2010? Explain your reasoning.

   Mr. Green was able to buy 25 pencil boxes in 2010.

   Mr. Green bought 4 packs of pencils, which cost $4. There would be $51 dollars remaining to buy pencil boxes because $\$55 - \$4 = \$51$. *Then I divide 51 ÷ 2, which is 25 with a remainder of 1. This means that Mr. Green would be able to buy 25 pencil boxes. The remainder of 1 means that Mr. Green would not be able to buy another pencil box because he does not have enough money.*

3. The school store collected a total of $1,371 by selling pencil boxes in the years 2011 through 2013. In 2011, the amount collected for pencil boxes was $670. In 2013, the amount collected for pencil boxes was $119. How many pencil boxes were sold in 2012? Explain your reasoning or show how you found your answer.

   I added $670 + $119 for 2011 and 2013 and got $789. Next, I subtracted $789 from $1,371 to find out the amount of money collected for 2012. The amount of money collected in 2012 for pencil boxes was $582. Then I had to figure out how many pencil boxes were sold in 2012, so I divided $582 by 3 because the pencil boxes cost $3.00 in 2012, and got 194. So there were 194 pencil boxes sold in 2012.

Alien Contest (ECR)

Overview

Students will use knowledge of factors and multiples to determine if certain alien creatures can participate in the contest.

Standard

Gain familiarity with factors and multiples.

4.OA.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

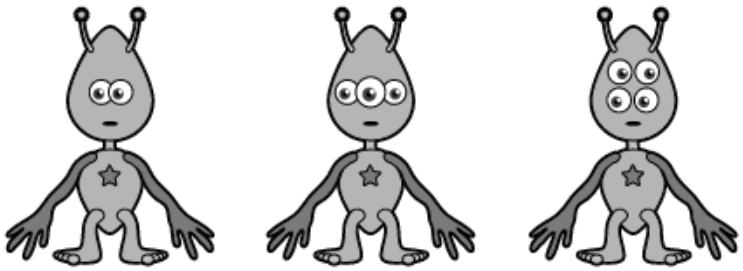
Grade Level Standard	The Following Standard Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Item
4.OA.B.4	• 3.OA.C.7	1. What are the factors of 96? a. 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96 2. Is 74 a multiple of 4? a. No 3. http://www.illustrativemathematics.org/illustrations/938	• http://learnzillion.com/lessonsets/123-find-and-understand-factors-and-determine-if-a-number-is-a-multiple-of-a-given-number-for-whole-numbers-0100

After the Task

Students who need additional practice with understanding factors and multiples may provide responses that show various operations to arrive at the correct answer. Provide additional practice where students use factors and multiples to answer questions. One sample problem is "Penelope brought 30 cupcakes to share with her friends. If Penelope does not keep any for herself, with how many friends could she share the cupcakes?" This sample problem will have multiple answers. Have students explain how they know their answers are correct.

Student Extended Constructed Response

The two-eyed space creatures, three-eyed space creatures, and four-eyed space creatures are having a contest to create a group with 24 total eyes.



1. How many two-eyed creatures are needed to make a group with 24 total eyes? How many three-eyed creatures are needed to make a group of 24 total eyes? How many four-eyed creatures are needed to make a group with 24 total eyes? Complete the chart below.

Creature Type	Number of Creatures
Two-eyed	
Three-eyed	
Four-eyed	

2. The creatures decide to have a contest to create a group with 40 total eyes. Only creatures that can form a group of 40 total eyes can participate, and groups can only have the same type of creatures (all two-eyed, three-eyed, or four-eyed). Can all three groups listed in question 1 participate in this contest? Tell how you know.

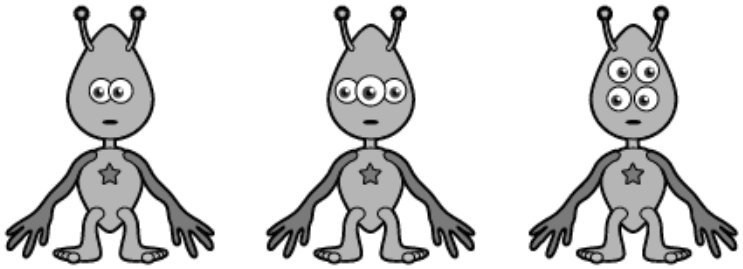
3. If other creature types decide to join in the contest described in question 2, which of the following creature groups could participate: one-eyed creatures, five-eyed creatures, seven-eyed creatures, or eight-eyed creatures? Explain your thinking.

4. The three-eyed creatures tell the six-eyed creatures that they cannot participate in the contest described in question 2. Is this true? Explain your thinking.

Adapted from: "The Contest" Item #43081-43804 http://sampleitems.smarterbalanced.org/itempreview/sbac/index.htm

Extended Constructed Response Exemplar Response

The two-eyed space creatures, three-eyed space creatures, and four-eyed space creatures are having a contest to create a group with 24 total eyes.



1. How many two-eyed creatures are needed to make a group with 24 total eyes? How many three-eyed creatures are needed to make a group of 24 total eyes? How many four-eyed creatures are needed to make a group with 24 total eyes? Complete the chart below.

Creature Type	Number of Creatures
Two-eyed	*12*
Three-eyed	*8*
Four-eyed	*6*

2. The creatures decide to have a contest to create a group with 40 total eyes. Only creatures that can form a group of 40 total eyes can participate, and groups can only have the same type of creatures (all two-eyed, three-eyed, or four-eyed). Can all three groups listed in question 1 participate in this contest? Tell how you know.

   No, the three-eyed creatures could not have a group to make a group with 40 total eyes. The number of eyes in groups of three-eyed creatures would be multiples of 3 (for example, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, etc.). They could create a group with a total of 39 eyes or 42 eyes, but not a group with 40 total eyes. 40 is not a multiple of 3.

3. If other creature types decide to join in the contest described in question 2, which of the following creature groups could participate: one-eyed creatures, five-eyed creatures, seven-eyed creatures, or eight-eyed creatures? Explain your thinking.

   The one-eyed, five-eyed, and eight-eyed creatures can participate because 1, 5, and 8 are factors of 40. The seven-eyed creatures could not participate because 7 is not a factor of 40.

4. The three-eyed creatures tell the six-eyed creatures that they cannot participate in the contest described in question 2. Is this true? Explain your thinking.

   Yes, it is true. The number of eyes in groups of six-eyed creatures would be multiples of 6 (for example, 6, 12, 18, 24, 30, 36, 42, etc.). They could have a group with a total of 36 eyes or 42 eyes. 40 is not a multiple of 6.

Card Game (IT)

Overview

Students will create 6-digit numbers by randomly selecting digits from a stack of cards. The goal of the game is to create the greatest or least value possible by deciding which place value each digit will represent. Students will compare the numbers they create with the numbers created by members of their team.

Standard

Generalize place value understanding for multi-digit whole numbers.

4.NBT.A.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NBT.A.2	• 4.NBT.A.1	1. Compare 67,746 to 76,746 using >, =, or <. a. 67,746 < 76,746 2. http://www.illustrativemathematics.org/illustrations/459	• http://www.illustrativemathematics.org/illustrations/1809 • http://learnzillion.com/lessonsets/167-read-write-and-compare-multidigit-whole-numbers • http://learnzillion.com/lessonsets/2-understand-place-value-in-terms-of-word-forms

Task Setup:

- Create groups of two (preferred) or three students.
- Create a set of numeral cards with the digits 0-9 for each group. Copy the Numeral Cards page provided in this task on cardstock and cut the cards out, or use index cards and markers to create the numeral cards.
- Copy the Card Game Rules so that there is one copy for each group.
- Copy the Card Game Recording Sheet for each student to use during the task.

Task Description:

1. Begin by showing the class how the card game is played.
    a. Have each student draw six horizontal line segments to represent places in a 6-digit number on a sheet of paper (e.g., ___ ___ ___ ___ ___ ___).
    b. Have a stack of numeral cards in the front of the class. Select a student to come up to select a card and show it to the class.
    c. Have the student decide the place value in which the digit should be written to create a 6-digit number with the greatest value possible.
    d. Record the choice for placement on a copy of the Card Game Recording Sheet, which is projected for class viewing, or draw a copy of the six positions on the board. Tell the rest of the class to decide where they would place the digit and record it on their papers.
    e. Discuss with students that they have the opportunity to pass on a digit once in the game.
        i. Discuss with students when the pass may be useful and show them where to record a digit should they decide to use it as their pass.
        ii. Tell students that once they pass on using a digit in their number, they must use all other numbers that are selected until all 6 places in their number are filled.
    f. Continue to have different students choose a card and decide on the placement in the number until all 6 places have been filled.
2. Once the number has been created, ask the class if anyone created a different number than the number shown on the board. If so, have that student share the number with the class. Compare the two numbers. Have students explain how they know which number is greater.
3. Students will play three rounds in which they try to create a number with the greatest value possible. Then they will play three rounds in which they try to create a number with the least value possible.
4. Explain that after all students in the group have created a number, group members will compare and order their numbers.
    a. In the rounds in which two students are to create a number with the greatest value possible, the student with the greater value will earn 3 points; the student with the lesser value will earn 1 point. In groups of three, the student with a number that is neither the greatest nor the least will earn 2 points.
    b. In the rounds in which two students are to create a number with the least value possible, the student with the lesser value will earn 3 points; the student with the greater value will earn 1 point. In groups of three, the student with a number that is neither the least nor the greatest will earn 2 points.
    c. For ties, each person will be awarded 2 points.
5. After the students understand the rules of the game, have them get into groups (preferably pairs). Hand out all of the materials: a set of numeral cards (one per group), card game rules (one per group), and the recording sheets (one per student).
6. Monitor the groups to be sure the students are following the rules of the game and to answer any questions they have about the game. Remind students that once they have decided where to write the digit and a new card has been chosen, they cannot change the placement of the digits.
7. As students compare and order the numbers created by group members, listen to their explanations and justifications. Ask probing questions as needed to encourage precision in student discussions.

After the Task

Give each student a copy of the Card Game Reflection Sheet and allow time for them to answer the questions. After students have had the opportunity to reflect on the game, lead a whole-class discussion about the different strategies students used to create their numbers to earn the most points. Ask students if there is a way to guarantee that they will always create a number with the greatest or least value.

This game can be played throughout the year with variations on the rules.

- Give each group two sets of digits so that digits can appear in more than one place in the number created.
- Place restrictions on certain place values in different rounds. For example, tell students that when creating a number with the least possible value, the digit in the hundred thousands place must be greater than 5, or when creating a number with the greatest possible value, the digit in the ones place must be greater than 5.
- Have students add or subtract the numbers they create to earn additional points based on whether the sum or difference has the greatest or least value in the group.
- Change the number of digits in the number to be created.
- Remove the option to pass on a number, or add a second pass option.

Numeral Cards

5	0
9	1
7	2
8	3
6	4

Card Game Rules

1. Shuffle the numeral cards and place them in a pile.
2. Each person will choose a card from the pile. The person with the greatest number will go first. Reshuffle the cards. The person chosen to go first will choose a card from the pile and show it to the group.
3. Write the digit on the card in one of the blanks in the 6-digit number you are creating, or in the Pass box on the right.
4. Play continues with the person on the left. Continue playing until everyone has created a six-digit number.
5. After everyone has created his or her number, compare and order the numbers created in the group. Award points to each group member as shown below:
    a. For Rounds 1 through 3:
        i. 3 points for the greatest number
        ii. 2 points for the middle number
        iii. 1 point for the least number
    b. For Rounds 4 through 6:
        i. 3 points for the least number
        ii. 2 points for the middle number
        iii. 1 point for the greatest number
    c. For ties, each person gets 2 points.
6. Repeat steps 1 through 5 to play five more rounds. Use your recording sheet to find the goal for each round.
7. The winner is the person with the most points at the end of all six rounds.

Card Game Recording Sheet Round 1 through Round 3

Round 1 through Round 3—Try to create a number with the **greatest** possible value.

Round 1:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 1: _____

Round 2:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 2: _____

Round 3:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 3: _____

Card Game Recording Sheet Round 4 through Round 6

Round 4 through Round 6—Try to create a number with the **least** possible value.

Round 4:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 4: _____

Round 5:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 5: _____

Round 6:

PASS

_____ _____ _____ , _____ _____ _____

Points for Round 6: _____

TOTAL POINTS FOR GAME: _____

Card Game Reflection Sheet

Think about the game you just played. Answer the questions below.

1. Did you ever have the number with the least value during Rounds 1-3? How could you change the place value of one digit so that you could earn more points?

2. Did you ever have the number with the greatest value during Rounds 4-6? How could you have changed your number so that you could earn more points?

3. How did you decide where to place the digits during each round? What change did you make in your strategy as you continued to play the game?

4. If you were to play this game again, what might your strategy be? Explain your reasoning.

Event Signs (IT)

Overview

Students will explore multiplication of fractions by whole numbers and solve problems involving area.

Standards

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

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

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

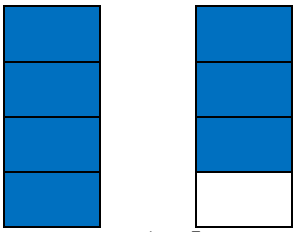
c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast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

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

4.MD.A.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor*.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NF.B.4a	• 3.OA.A.1 • 3.NF.A.1 • 4.OA.A.2	1. The model below represents two chocolate bars. Each bar has been divided into four equal pieces. Write an equation using $\frac{1}{4}$ to represent the shaded portion of the model.  a. $7 \times \frac{1}{4} = \frac{7}{4}$	• http://www.illustrativemathematics.org/illustrations/833 • http://www.illustrativemathematics.org/illustrations/263 • http://learnzillion.com/lessonsets/478-understand-multiplication-of-fractions-by-whole-numbers • http://learnzillion.com/lessons/1429-multiply-a-fraction-by-a-whole-number-using-visual-models-and-repeated-addition
4.NF.B.4c	• 3.OA.A.3	1. You have 4 pieces of $\frac{1}{3}$ of a chocolate bar.	• http://www.illustrativemathematics.org/illustrations/365

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		How many chocolate bars do you have? a. $\frac{4}{3}$ or $1\frac{1}{3}$ chocolate bars 2. http://www.illustrativemathematics.org/illustrations/857	• http://learnzillion.com/lessonsets/429-solve-word-problems-involving-multiplication-of-fractions-by-whole-numbers • http://learnzillion.com/lessons/1430-word-problems-involving-multiplying-a-fraction-by-a-whole-number • http://learnzillion.com/lessons/126-multiply-fractions-by-whole-numbers-using-models
4.MD.A.3	• 3.OA.A.4 • 3.MD.C.7 b • 3.MD.D.8	1. A rectangle is 2 feet wide by 3 feet tall. What is the area of the rectangle? a. $2 \times 3 = 6$ square feet 2. http://www.illustrativemathematics.org/illustrations/876	• http://www.illustrativemathematics.org/illustrations/1814 • http://learnzillion.com/lessonsets/729-applying-formulas-for-rectangle-area-and-perimeter • http://learnzillion.com/lessonsets/380-apply-formulas-for-area-and-perimeter

Materials Needed:

Each student will need a blank sheet of paper, 2 markers or colored pencils, a ruler, and scissors.

During the Task

- Students may need help using their rulers. Remind them to measure from the edge of their papers.
- Remind students that there is no correct size for the final sign as long as the side lengths are whole numbers.
- Students may work in groups to complete this task.
- Students may be provided with pieces of paper cut into $\frac{1}{2}$-inch x 1-inch strips to place along the edges of the paper instead of coloring.
- In problem 5, students may find the dimensions of the blank space by subtracting the length of the rectangles (1 inch) from each side, then multiplying (11 – 1 = 10 and 8 – 1 = 7, 10 x 7 = 70 in^2). Have students relate this method to using the width of the rectangles (1/2-inch) to find the dimensions of the blank space (see the exemplar response).

After the Task

Have students provide different dimensions for their signs and calculate the areas of their signs.

Student Instructional Task

Your class is in charge of advertising for an upcoming school event. You will be making signs to hang around school. Use a blank sheet of paper to complete the following.

1. Measure each side of the paper. Record the measurements. Remember to include the units with your measurement.

   Shorter side: _____

   Longer side: _____

2. On the shorter side of the paper, from the left edge of the paper, draw 1-inch vertical segments at $\frac{1}{2}$-inch intervals until you reach the right edge of the paper. Draw a horizontal line connecting the top of each 1-inch vertical segment to create a series of rectangles along the shorter side of the paper. Color the rectangles in alternating colors.

   a. What is the area of one of the rectangles you drew? Write a multiplication equation to represent the area.

   b. What is the total area of the rectangles drawn along the shorter side of the paper? Write a multiplication equation to represent the total area.

3. Turn the paper so the rectangles you drew in part 2 are on the right side of the paper. On the longer side of the paper, from the left edge of the paper, draw 1-inch vertical segments at $\frac{1}{2}$-inch intervals until you reach the rectangles on the right side of the paper. Draw a horizontal line connecting the top of each 1-inch vertical segment to create a series of rectangles along the longer side of the paper. Color the rectangles in alternating colors. What is the total area of the rectangles you drew along the longer side of the paper? Do not include the rectangles you drew in part 2. Write a multiplication equation to represent the area.

4. Trim your paper so that both sides are whole numbers. The area of your sign should be less than 90 square inches (or 602 square centimeters). What are the dimensions of your sign? What is the total area of your sign? Show your work.

5. The blank white space on the sign is where you will include information about the school event. What is the area of the blank white space? Write a multiplication equation to show that area.

6. You are going to hang a sign by the door of each classroom at your school. What will be the total area of all of the signs?

Instructional Task Exemplar Response

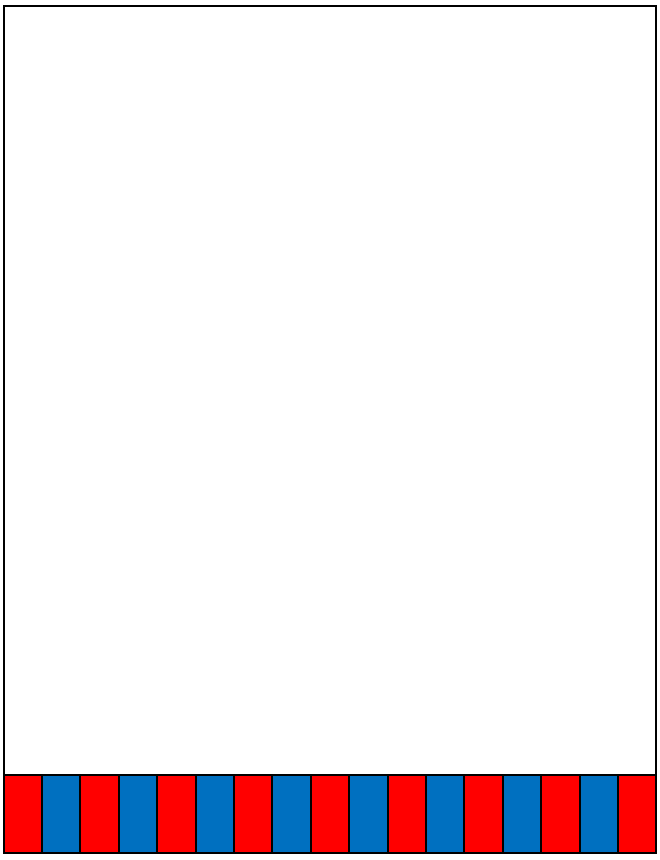
Your class is in charge of advertising for an upcoming school event. You will be making signs to hang around school. Use a blank sheet of paper to complete the following.

1. Measure each side of the paper. Record the measurements. Remember to include the units with your measurement.

   Shorter side: $8\frac{1}{2}$ *inches (or 21.5 cm)*

   Longer side: *11 inches (or 28 cm)*

2. On the shorter side of the paper, from the left edge of the paper, draw 1-inch vertical segments at $\frac{1}{2}$-inch intervals until you reach the right edge of the paper. Draw a horizontal line connecting the top of each 1-inch vertical segment to create a series of rectangles along the shorter side of the paper. Color the rectangles in alternating colors.



a. What is the area of one of the rectangles you drew? Write a multiplication equation to represent the area.

$$\frac{1}{2} in \times 1\ in = \frac{1}{2} in^2$$

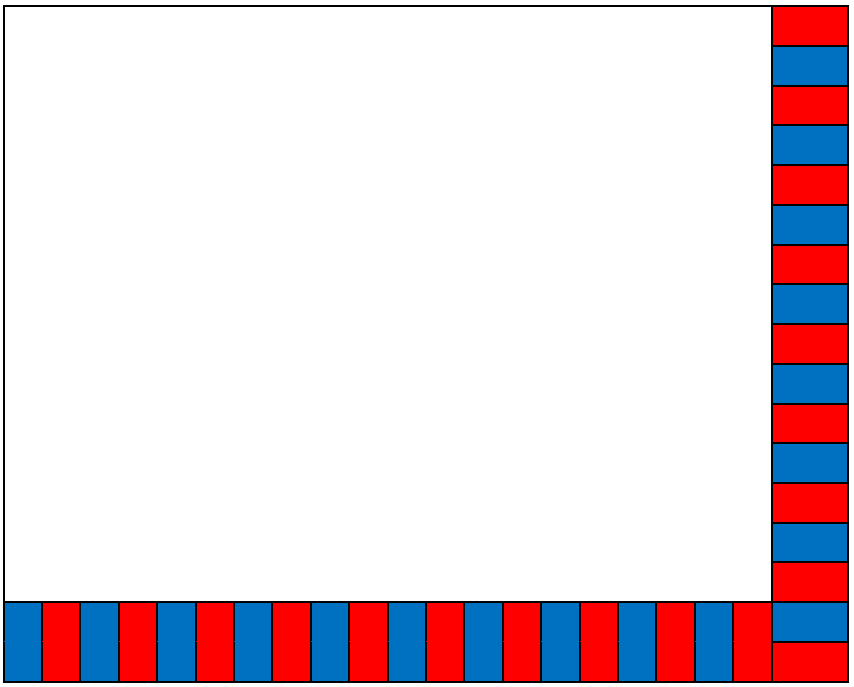
b. What is the total area of the rectangles drawn along the shorter side of the paper? Write a multiplication equation to represent the area.

Each rectangle has the same measurements, so each rectangle has the same area. There are 17 rectangles.

$$17 \times \frac{1}{2}\ in^2 = \frac{17}{2}\ in^2$$

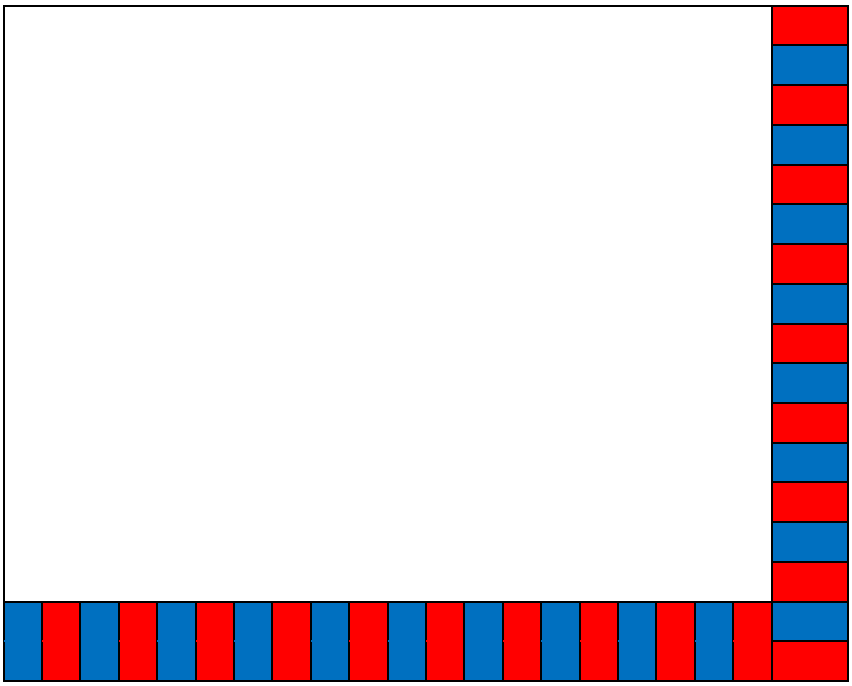
The total area of all rectangles is $\frac{17}{2}\ in^2$.

3. Turn the paper so the rectangles you drew in part 2 are on the right side of the paper. On the longer side of the paper, from the left edge of the paper, draw 1-inch vertical segments at $\frac{1}{2}$-inch intervals until you reach the rectangles on the right side of the paper. Draw a horizontal line connecting the top of each 1-inch vertical segment to create a series of rectangles along the longer side of the paper. Color the rectangles in alternating colors. What is the total area of the rectangles you drew along the longer side of the paper? Do not include the rectangles you drew in part 2. Write a multiplication equation to represent the area.



The area of the rectangles drawn on the longer side is $20 \times \frac{1}{2} in^2 = \frac{20}{2} in^2$ *or 10* in^2.

4. Trim your paper so that both sides are whole numbers. The area of your sign should be less than 90 square inches (or 602 square centimeters). What are the dimensions of your sign? What is the total area of your sign? Show your work.



Answers will vary. Students may choose to make signs using any whole number side length.

Sample response:

I cut $\frac{1}{2}$ *inch off of the short side of the paper. My dimensions for my sign are 8 inches by 11 inches.*

$$Area = length \times width$$
$$Area = 8 \times 11$$
$$Area = 88\ square\ inches$$

5. The blank white space on the sign is where you will include information about the school event. What is the area of the blank white space? Write a multiplication equation to show that area.

Answers will depend on the size of the student's sign. Sample response:

The long side of the white space is $20 \times \frac{1}{2}$ *in or 10 in long. Since I cut* $\frac{1}{2}$ *inch off of the short side, the length of the short side of the white space is* $14 \times \frac{1}{2}$ *in or 7 in. The area of the white space is 10 in x 7 in = 70 in*^{2}.

6. You are going to hang a sign by the door of each classroom at your school. What will be the total area of all of the signs?

   Answers will depend on the number of classrooms at your school and the size of the student's sign. Sample response:

   There are 15 classrooms at my school. $88 \times 15 = 1320\ square\ inches$

   The total area of all signs will be 1320 square inches.

Teacher Appreciation Week (IT)

Overview

Students will apply their understanding of multiplication of a fraction by a whole number by finding how many brownies were originally on a tray before some of them were eaten by a group of teachers. Students should know the process of multiplying a fraction by a whole number prior to starting a task.

Standard

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

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

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NF.B.4c	• 3.OA.A.3	1. A recipe for banana nut bread calls for $\frac{1}{4}$ cup of walnuts. If you want to make 3 loaves of banana nut bread, how many cups of walnuts do you need? a. $\frac{3}{4}$ 2. Julie ate $\frac{1}{6}$ of the cookies her mom left out. After Julie ate some, there were 10 cookies left on the plate. How many cookies did Julie eat? a. 2 cookies 3. http://www.illustrativemathematics.org/illustrations/857	• http://www.illustrativemathematics.org/illustrations/344 • http://www.illustrativemathematics.org/illustrations/365 • http://www.illustrativemathematics.org/illustrations/262 • http://learnzillion.com/lessonsets/429-solve-word-problems-involving-multiplication-of-fractions-by-whole-numbers • http://learnzillion.com/lessons/1430-word-problems-involving-multiplying-a-fraction-by-a-whole-number • http://learnzillion.com/lessons/126-multiply-fractions-by-whole-numbers-using-models

During the Task

- Have students work on this task individually for about 10 minutes in the beginning.
- After the individual time, group students in pairs so they can share their work and thoughts about how to approach the task.
- Provide students with manipulatives to help them work through the task. Remind students to record their work with the manipulatives by drawing a sketch of their fraction models.
- Some students may have trouble getting started with the task. Ask those students, "How might you work backward to begin this task?"
- Some students may confuse the amount taken with the amount remaining. Ask students probing questions like, "If 1/3 of the brownies are taken, what fraction would be remaining?"
- For students who may be writing answers without explanations, ask them how they might explain their reasoning so that someone in another class understands their work.

After the Task

Have students think of other ways they can solve the same problem. Provide students with additional practice solving word problems involving multiplication of a fraction by a whole number, including problems where one of the factors is unknown.

Student Instructional Task

This week is Teacher Appreciation Week. Each day there will be a tray of sweets in the lounge for the teachers to enjoy.

1. Mrs. Blakely brought a tray of brownies and placed it in the teachers' lounge at school one morning. Mr. Granier went into the lounge before lunch and took $\frac{1}{3}$ of the brownies on the tray. Later that day, Mrs. Poche went into the lounge and took $\frac{1}{4}$ of the remaining brownies. Right before school ended, Mr. Scott went into the lounge and took $\frac{1}{2}$ of the remaining brownies. After school, Mrs. Blakely went to get the tray and found that 6 brownies had not been eaten.

    a. How many brownies were on the tray when Mrs. Blakely first placed it in the lounge? Explain your reasoning. Use equations or visual fraction models to support your explanation.

    b. Which teacher took the greatest fraction of the total number of brownies Mrs. Blakely left in the lounge?

2. Imagine that you have made a tray of cookies and are leaving them in the lounge for the teachers. Write your own word problem. Decide how many teachers will take what fractions of the cookies on the tray when they visit the lounge. Make sure that in your problem you include a question that requires someone to figure out how many cookies were originally on your tray. After you write your problem, provide the solution. Be sure to show all of your work.

Instructional Task Exemplar Response

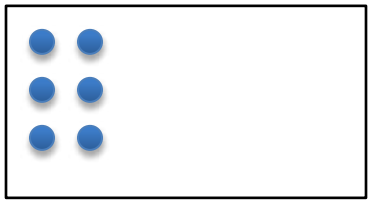
This week is Teacher Appreciation Week. Each day there will be a tray of sweets in the lounge for the teachers to enjoy.

1. Mrs. Blakely brought a tray of brownies and placed it in the teachers' lounge at school one morning. Mr. Granier went into the lounge before lunch and took $\frac{1}{3}$ of the brownies on the tray. Later that day, Mrs. Poche went into the lounge and took $\frac{1}{4}$ of the remaining brownies. Right before school ended, Mr. Scott went into the lounge and took $\frac{1}{2}$ of the remaining brownies. After school, Mrs. Blakely went to get the tray and found that 6 brownies had not been eaten.

    a. How many brownies were on the tray when Mrs. Blakely first placed it in the lounge? Explain your reasoning. Use equations or visual fraction models to support your explanation.

Mrs. Blakely found 6 brownies.

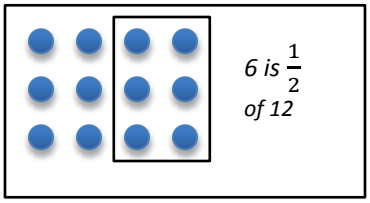
This is the number of brownies Mr. Scott left.



Mr. Scott took $\frac{1}{2}$ of the number of brownies he found. $\frac{1}{2} \times ? = 6$

? is the number of brownies Mr. Scott found.

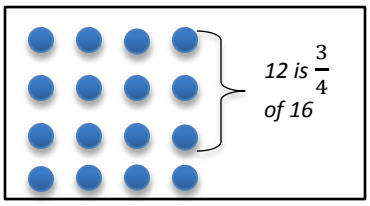
Mr. Scott found 12 brownies.



Mrs. Poche left 12 brownies after taking $\frac{1}{4}$ of the number of brownies she found, so 12 is $\frac{3}{4}$ of the number of brownies Mrs. Poche found. $\frac{3}{4} \times ? = 12$

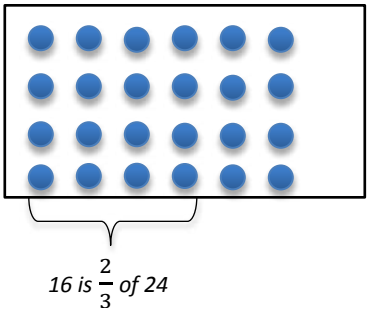
? is the number of brownies Mrs. Poche found.

Mrs. Poche found 16 brownies.



Mr. Granier left 16 brownies after taking $\frac{1}{3}$ of the number of brownies he found, so 16 is $\frac{2}{3}$ of the number of brownies Mr. Granier found. $\frac{2}{3} \times ? = 16$

? is the number of brownies Mr. Granier found, which is also the number of brownies Mrs. Blakely placed in the lounge.



Mrs. Blakely placed a tray of 24 brownies in the lounge in the morning.

b. Which teacher took the greatest fraction of the total number of brownies Mrs. Blakely left in the lounge? Explain your reasoning.
Mr. Granier took 8 brownies. That is $\frac{8}{24}$ of the total number of brownies.

Mrs. Poche took 4 brownies. That is $\frac{4}{24}$ of the total number of brownies.

Mr. Scott took 6 brownies. That is $\frac{6}{24}$ of the total number of brownies.

Therefore, Mr. Granier took the greatest fraction of the total number of brownies because $\frac{8}{24}$ is the greatest fraction of the three. Since the denominator is the same on all three fractions, I can compare the numerators—8 is the greatest number.

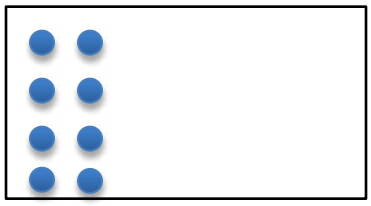
2. Imagine that you have made a tray of cookies and are leaving them in the lounge for the teachers. Write your own word problem. Decide how many teachers will take what fractions of the cookies on the tray when they visit the lounge. Make sure that in your problem you include a question that requires someone to figure out how many cookies were originally on your tray. After you write your problem, provide the solution. Be sure to show all of your work.

Answers will vary. Sample response:

Jamie brought a tray of cookies to place in the teachers' lounge on Tuesday. Later that morning, Mrs. Breaux went into the lounge and took $\frac{1}{4}$ of the cookies. Right before lunch, Mr. Smith went into the lounge and took $\frac{1}{3}$ of the remaining cookies. After lunch, Mrs. Babin ate $\frac{1}{2}$ of the remaining cookies. After school, Mr. Thomas went to get the tray and found it with 8 cookies left. How many cookies were on the tray when Jamie first left it in the lounge?

Mr. Thomas found 8 cookies.

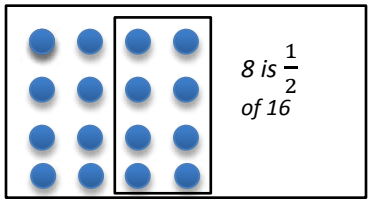
This is the number of cookies Mrs. Babin left.



Mrs. Babin ate $\frac{1}{2}$ of the number of cookies she found.
? is the number of brownies Mrs. Babin found.

$\frac{1}{2} \times ? = 8$

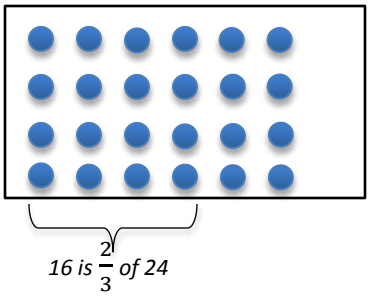
Mrs. Babin found 16 cookies.



Mr. Smith left 16 cookies after taking $\frac{1}{3}$ of the number of cookies he found, so 16 is $\frac{2}{3}$ of the number of cookies Mr. Smith found.
? is the number of cookies Mr. Smith found.

Mr. Smith found 24 cookies.

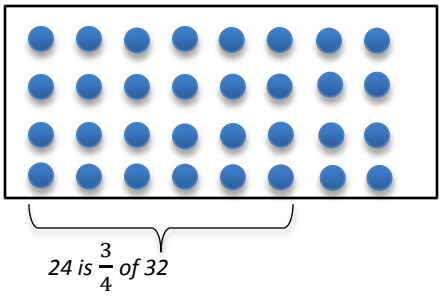
$\frac{2}{3} \times ? = 16$



Mrs. Breaux left 24 cookies after taking $\frac{1}{4}$ of the number of cookies she found, so 24 is $\frac{3}{4}$ of the number of cookies Mrs. Breaux found.
? is the number of cookies Mrs. Breaux found.

Mrs. Breaux found 32 cookies.

$\frac{3}{4} \times ? = 24$



Jamie placed 32 cookies in the lounge.

Dollars and Cents (IT)

Overview

Students will apply their knowledge of the value of coins to compare decimals and fractions with denominators of 10 and 100.

Standards

Understand decimal notation for fractions, and compare decimal fractions.

4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

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

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.NF.C.5	• 4.NF.A.1 • 4.NF.B.3a-c	1. Write a fraction equivalent to $\frac{4}{10}$ using a denominator of 100. a. $\frac{40}{100}$ 2. Add $\frac{73}{100} + \frac{6}{10}$. a. $\frac{133}{100}$ or $1\frac{33}{100}$ 3. http://www.illustrativemathematics.org/illustrations/153 4. http://www.illustrativemathematics.org/illustrations/154	• http://www.illustrativemathematics.org/illustrations/743 • http://www.illustrativemathematics.org/illustrations/881 • http://www.illustrativemathematics.org/illustrations/831 • http://www.illustrativemathematics.org/illustrations/837 • http://www.illustrativemathematics.org/illustrations/835 • http://learnzillion.com/lessonsets/523-express-fractions-with-a-denominator-of-10-as-equivalent-to-fractions-with-denominators-of-100 • http://learnzillion.com/lessonsets/291-express-a-fraction-with-denominator-10-as-an-equivalent-fraction-with-denominator-100 • http://learnzillion.com/lessonsets/10-convert-between-fractions-and-decimals
4.NF.C.6	• 4.NF.C.5	1. Write $\frac{54}{100}$ in decimal notation.	• http://learnzillion.com/lessonsets/292-use-decimal-notation-for-fractions-with-denominators-10-or-100 • http://learnzillion.com/lessonsets/10-convert-between-

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		a. 0.54 2. Write $\frac{17}{10}$ in decimal notation. a. 1.7 3. Write 0.35 as a fraction. a. $\frac{35}{100}$ 4. http://www.illustrativemathematics.org/illustrations/152 5. http://www.illustrativemathematics.org/illustrations/103	fractions-and-decimals
4.NF.C.7	• 4.NF.C.2 • 4.NF.C.6	1. Shelli has 0.54 of a meter of ribbon, and Juno has 0.45 of a meter of ribbon. Write a statement using <, =, or > to compare the amount of ribbon Shelli has to the amount of ribbon Juno has. a. 0.54 meter > 0.45 meter 2. http://www.illustrativemathematics.org/illustrations/182	• http://www.illustrativemathematics.org/illustrations/812 • http://www.illustrativemathematics.org/illustrations/811 • http://www.illustrativemathematics.org/illustrations/183 • http://learnzillion.com/lessonsets/672-compare-two-decimals-to-hundredths

During the Task

- When students begin writing the fractions for the values in the table, they may not know what denominator to use. Students may try to add the number of coins each friend has and use that as the denominator. Remind students that they are finding the amount of money, and ask them, "How many cents are in a dollar?"
- Pay attention to students who are using the values in the table as the numerator without finding the value of the coins listed. Guide students to find the value of the coins in each cell of the table before writing the fractions.
- Students may struggle with determining how much money each friend brought to school. Students are not expected to add decimals in 4th grade (this is reserved for 5th grade). Therefore, students will need to find the total by adding the fractions. Once students write fractions that all have a denominator of 100, they will be able to add the fractions. Have students rewrite the improper fractions as mixed numbers. Discuss what the whole number in the mixed numbers means in terms of the money they are using.
- Students may use manipulative (base 10 blocks, unit cubes, grid paper) to help compare decimals and fractions and write equivalent fractions.

After the Task

Discuss with students the prices of items they would like to purchase from the store. Students may conduct research to find prices of various items. Students should write the prices of the items they want to purchase as fractions and then find the total cost of the items. Guide students in a discussion about how they can save enough money to buy the items they have researched.

Student Instructional Task

The table below shows how many of each type of coin each of five friends brought to school. Use the table to answer the questions that follow.

	Pennies	Nickels	Dimes	Quarters
Ali	27	4	11	6
Sally	64	5	2	1
Karl	118	3	6	3
Tisa	38	8	9	5
Marie	52	15	5	8

1. What fraction of a dollar does Ali have in nickels? Write your answer as a fraction with a denominator of 100 and as a decimal.

2. Tisa wrote the fraction $\frac{4}{10}$ to represent the value of one type of coin she has. Which of her groups of coins can be represented with this fraction? How much money does the fraction represent?

3. Write the amount of money Marie has in pennies as a decimal. Write the amount of money Marie has in dimes as a decimal. Compare the decimals you wrote using <, =, or >. Draw a model to justify your comparison.

4. Sally wants to know how much money she has in just pennies and dimes. Use fractions to show how much money Sally has if she combines her pennies and dimes.

5. Write a statement using <, =, or > to compare how much money Ali has in dimes to the amount of money he has in quarters. Use decimals or fractions in your comparison.

6. Which friend brought the most money to school? Using fractions, show how you know your answer is correct. Write the total amount of money each friend brought as a fraction and as a decimal.

7. Another friend, Chang, brought more money than Karl but less than Ali. What amount of money could Chang have brought? Write your answer as a fraction and as a decimal.

8. A seventh friend, Abe, says he has $1\frac{68}{100}$ dollars in coins in his bank at home. Write this as a decimal. Is this more or less money than Sally? Use a model to show you are correct.

Instructional Task Exemplar Response

The table below shows how many of each type of coin each of five friends brought to school. Use the table to answer the questions that follow.

	Pennies	Nickels	Dimes	Quarters
Ali	27	4	11	6
Sally	64	5	2	1
Karl	118	3	6	3
Tisa	38	8	9	5
Marie	52	15	5	8

1. What fraction of a dollar does Ali have in nickels? Write your answer as a fraction with a denominator of 100 and as a decimal.

   4 nickels is 20 cents, which is $\frac{20}{100}$ *of a dollar. As a decimal, that is 0.20.*

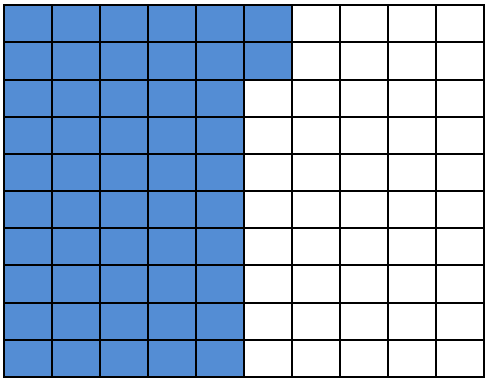
2. Tisa wrote the fraction $\frac{4}{10}$ to represent the value of one type of coin she has. Which of her groups of coins can be represented with this fraction? How much money does the fraction represent?

   $\frac{4}{10}$ *represents Tisa's nickels. This is 40 cents or $0.40.*

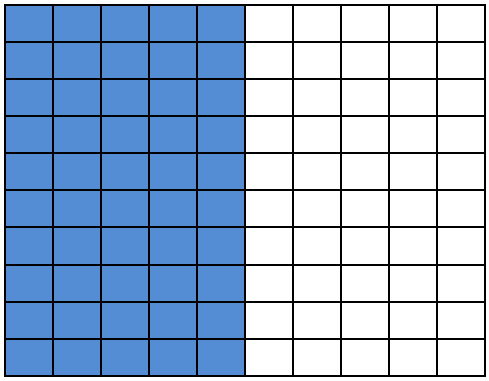
3. Write the amount of money Marie has in pennies as a decimal. Write the amount of money Marie has in dimes as a decimal. Compare the decimals you wrote using <, =, or >. Draw a model to justify your comparison.

   Marie has 0.52 *in pennies. Marie has 0.5 in dimes. 0.52 > 0.5*

   0.52



   0.5



4. Sally wants to know how much money she has in just pennies and dimes. Use fractions to show how much money Sally has if she combines her pennies and dimes.

   Pennies: $\frac{64}{100}$ *Dimes:* $\frac{2}{10}$ $\frac{64}{100} + \frac{2}{10} = \frac{64}{100} + \frac{20}{100} = \frac{84}{100}$ *Maria has* $\frac{84}{100}$ *of a dollar or $0.84.*

5. Write a statement using <, =, or > to compare how much money Ali has in dimes to the amount of money he has in quarters. Use decimals or fractions in your comparison.

   Dimes: $\frac{11}{10} = \frac{110}{100}$ *Quarters:* $\frac{150}{100}$ $\frac{110}{100} < \frac{150}{100}$

6. Which friend brought the most money to school? Using fractions, show how you know your answer is correct. Write the total amount of money each friend brought as a fraction and as a decimal.

   Ali: $\frac{27}{100} + \frac{20}{100} + \frac{110}{100} + \frac{150}{100} = \frac{307}{100}$*; Ali has $3.07*

   Sally: $\frac{64}{100} + \frac{25}{100} + \frac{20}{100} + \frac{25}{100} = \frac{134}{100}$*; Maria has $1.34*

   Karl: $\frac{118}{100} + \frac{15}{100} + \frac{60}{100} + \frac{75}{100} = \frac{268}{100}$*; Karl has $2.68*

   Tisa: $\frac{38}{100} + \frac{40}{100} + \frac{90}{100} + \frac{125}{100} = \frac{293}{100}$*; Tisa has $2.93*

   Marie: $\frac{52}{100} + \frac{75}{100} + \frac{50}{100} + \frac{200}{100} = \frac{377}{100}$*; Marie has $3.77*

   Marie brought the most money to school.

7. Another friend, Chang, brought more money than Karl but less than Ali. What amount of money could Chang have brought? Write your answer as a fraction and as a decimal.

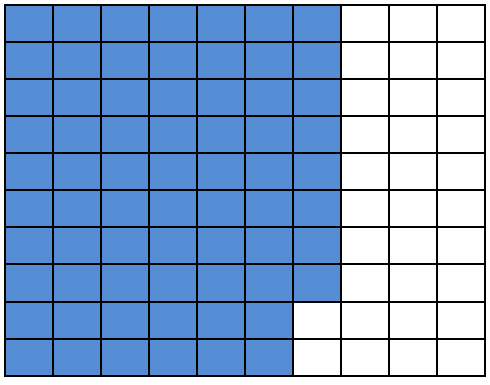
   Sample answer (any answer between $2.68 and $3.07 could be given):

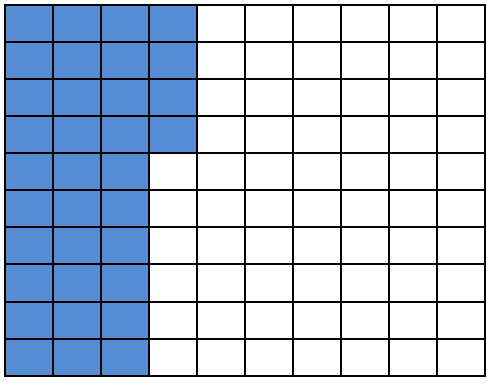
   Chang could have $2.75 or $\frac{275}{100}$.

8. A seventh friend, Abe, says he has $1\frac{68}{100}$ dollars in coins in his bank at home. Write this as a decimal. Is this more or less money than Maria? Use a model to show you are correct.

   $1\frac{68}{100} = 1.68$ *This is more money than Sally. Since both have the same whole number, 1, I only have to compare the places after the decimal.*

   0.68 *0.34*





Class Picnic (IT)

Overview

Students will apply their understanding of factors and multiples to determine the amount of food needed for the class picnic.

Standards

Use the four operations with whole numbers to solve problems.

4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding.

Gain familiarity with factors and multiples.

4.OA.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.OA.A.3	• 3.OA.D.8 • 4.NBT.A.3	1. Salim wants to buy a new MP3 player, which costs $75, including tax. He already has $22 saved. If Salim saves $2 per week from his allowance, how many weeks will he have to save to have enough to buy the MP3 player? a. 27 weeks 2. http://www.illustrativemathematics.org/illustrations/1289	• http://www.illustrativemathematics.org/illustrations/13 • http://www.illustrativemathematics.org/illustrations/1301 • http://www.illustrativemathematics.org/illustrations/1807 • http://learnzillion.com/lessonsets/415-solve-multistep-word-problems-using-the-four-operations • http://learnzillion.com/lessonsets/352-solve-multistep-word-problems • http://learnzillion.com/lessonsets/47-assess-the-reasonableness-of-multiplication-and-division-answers • http://learnzillion.com/lessonsets/46-assess-the-reasonableness-of-answers-in-addition-and-subtraction-problems • http://learnzillion.com/lessonsets/5-solve-multistep-word-problems

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
4.OA.B.4	• 3.OA.C.7	1. Find all factor pairs of 72. a. 1 and 72, 2 and 36, 3 and 24, 4 and 18, 6 and 12, 8 and 9 2. Is 37 a multiple of 7? How do you know? a. No, 37 is not a multiple of 7 because 7 times 5 is 35, which is only two away from 37. There is no whole number that can be multiplied by 7 to get 37. 3. http://www.illustrativemathematics.org/illustrations/938	• http://learnzillion.com/lessonsets/123-find-and-understand-factors-and-determine-if-a-number-is-a-multiple-of-a-given-number-for-whole-numbers-0100

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- What is a picnic? A picnic is when a person or a group of people prepare and pack a meal that is eaten outside.

During the Task

- This task is often used to find the least common multiple or greatest common factor. Understanding least common multiple (LCM) or greatest common factor (GCF) is not a requirement of 4th grade students as the skill/concept is left for 6th grade. Students can complete these problems by applying their understanding of multiples without understanding the concept of LCM or GCF.
- Provide students with manipulatives to work with as they are working to find the number of packages of hot dogs and hot dog buns they will need. Manipulatives can include paper cups, chips, unit cubes, etc.
- Guide students to create a chart, if necessary, to organize their thinking as they find the number of packages needed to have exactly the same number of hot dogs and buns.
- There are two conditions to the number of packages needed in problem 3—a minimum number of hot dogs needed and Isaac's desire to have exactly the same number of hot dogs and buns. Ask students, "How can you apply your understanding from problem 1 to this new scenario?" Students should realize they are looking for one number that is a multiple of 10 and a multiple of 8 that is greater than 60.

After the Task

Have students plan a picnic for their own class. They should decide who will bring what types of food and drinks. Have students help each other determine the number of packages of the food and drinks they would need to have enough for the class. Discuss whether the number of packages is a factor or a multiple of the number of snacks there will be. Discuss the difference between the terms *factor* and *multiple* as they relate to the context of buying food and drink.

Student Instructional Task

Isaac is planning a picnic for his classmates. Everyone planning to attend the picnic wants to eat hot dogs. He knows that the local store sells hot dogs in packages of 10. The store sells hot dogs buns in packages of 8.

1. What is the fewest number of packages of hot dogs and hot dog buns Isaac can buy to have exactly the same amount of hot dogs and buns? Show how you determined your answer.

2. Isaac discovers that 30 people are coming to the picnic, and everyone wants to eat 2 hot dogs! What is the fewest number of packages of hot dogs Isaac will have to buy to feed all 30 people? What is the fewest number of packages of buns Isaac will have to buy to feed all 30 people? Show how you know.

	Total number needed	**Number in package**	**Total packages needed**
Hot dogs			
Hot dog buns			

3. Isaac notices he will have more hot dog buns than hot dogs. He doesn't want to waste food, so he decides to feed the teachers in the other grades.
   a. What is the fewest number of packages of hot dogs and hot dog buns will Isaac need to buy to have **exactly the same** number of hot dogs and buns to feed all 30 people two hot dogs each? Tell how you know.

   b. How many extra hot dogs will there be to feed the teachers in the other grades? Explain how you know.

c. If each teacher in the other grades eats two hot hogs, how many teachers can eat? Explain your reasoning.

4. Isaac asks some of his classmates to bring some other items for the picnic. Help Isaac's friends figure out what they need to buy.
   a. Tanya will bring the ketchup. She already has 3 bottles, and each bottle has enough for 20 hot dogs. How many more bottles of ketchup will Tanya need to buy so there is enough ketchup for all of the hot dogs? Show how you found your answer.

   b. Jordan is asked to bring mustard, and she finds boxes of mustard packets at a local grocery store. One box has 5 mustard packets. How many boxes of mustard packets must Jordan buy to have enough mustard for all of the hot dogs, if one packet is used for each hot dog? Show how you found your answer.

Instructional Task Exemplar Response

Isaac is planning a picnic for his classmates. Everyone planning to attend the picnic wants to eat hot dogs. He knows that the local store sells hot dogs in packages of 10. The store sells hot dogs buns in packages of 8.

1. What is the fewest number of packages of hot dogs and hot dog buns Isaac can buy to have exactly the same amount of hot dogs and buns? Show how you determined your answer.

   Solution:

   hot dog packages *hot dog bun packages*

   Isaac would need to buy 4 packages of hot dogs and 5 packages of hot dog buns to have exactly the same number of hot dogs and hot dog buns. Count by multiples of 10 and multiples of 8.

2. Isaac discovers that 30 people are coming to the picnic, and everyone wants to eat 2 hot dogs! What is the fewest number of packages of hot dogs Isaac will have to buy to feed all 30 people? What is the fewest number of packages of buns Isaac will have to buy to feed all 30 people? Show how you know.

	Total number needed	**Number in package**	**Total packages needed**
Hot dogs	*30 people x 2 hot dogs = 60 hot dogs*	*10*	*6 packages of hot dogs x 10 = 60 hot dogs*
Hot dog buns	*30 people x 2 hot dogs = 60 hot dog buns*	*8*	*8 packages of hot dog buns x 8 = 64 hot dog buns* *7 packages would only be 56 buns (7 x 8), which is not enough*

3. Isaac notices he will have more hot dog buns than hot dogs. He doesn't want to waste food, so he decides to feed the teachers in the other grades.
   a. What is the least number of packages of hot dogs and hot dog buns will Isaac need to buy to have **exactly the same number** of hot dogs and buns and still be able to feed all 30 people two hot dogs each? Tell how you know.

      Solution: 30 x 2 = 60 hot dogs will be needed to feed all 30 people.

      hot dog packages *hot dog bun packages*

Since Isaac will need at least 60 hot dogs, he will need to buy 8 packages of hot dogs and 10 packages of hot dog buns to have exactly the same number of hot dogs and hot dog buns.

b. How many extra hot dogs will there be to feed the teachers in the other grades? Explain how you know.

Solution: 80 total hot dogs will be made. 60 of them will be used to feed the other people. So, there will be 20 hot dogs left to feed the teachers in the other grades.

c. If each teacher in the other grades eats two hot hogs, how many teachers can eat? Explain your reasoning.

Solution: There will be 20 hot dogs left over. If each teacher eats two hot dogs, then 10 teachers can eat.

4. Isaac asks some of his classmates to bring some other items for the picnic. Help Isaac's friends figure out what they need to buy.
   a. Tanya will bring the ketchup. She already has 3 bottles, and each bottle has enough for 20 hot dogs. How many more bottles of ketchup will Tanya need to buy so there is enough ketchup for all of the hot dogs? Show how you found your answer.

   Solution: 3 bottles x 20 servings = 60 servings total

   80 servings needed – 60 servings = 20 more servings needed

   1 bottle has 20 servings, so Tanya needs to buy 1 more bottle of ketchup.

   b. Jordan is asked to bring mustard, and she finds boxes of mustard packets at a local grocery store. One box has 5 mustard packets. How many boxes of mustard packets must Jordan buy to have enough mustard for all of the hot dogs, if one packet is used for each hot dog? Show how you found your answer.

   Solution: 80 packets are needed. 16 boxes x 5 packets = 80 packets. So Jordan needs to buy 16 boxes of mustard packets.

5TH GRADE TOOLS

5TH GRADE TOOLS

5th Grade Remediation Guide

As noted in the "Remediation" on page 12 isolated remediation helps target the skills students need to more quickly access and practice on-grade level content. This chart is a reference guide for teachers to help them more quickly identify the specific remedial standards necessary for every fifth grade math standard[7].

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	*None- Introduced in 5th Grade*		
5.OA.A.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*	• K.OA • 1.OA • 2.OA • 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2	• 5.OA.A.1	• 5.NF.B.5
5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	• 4.OA.C.5		
5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	• 4.NBT.A.1 • 4.NF.C.5 • 4.NF.C.6 • 4.NF.C.7		
5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.		• 5.NBT.A.1	• 5.NBT.B.5 *(no fluency)* • 5.NBT.B.7

[7] This content comes from the work of the math standards' authors found here: http://www.edutron.com/0/Math/ccssmgraph.htm

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.NBT.A.3 Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	• 4.NBT.A.3 • 4.NF.B.7	• 5.NBT.A.1	
5.NBT.A.4 Use place value understanding to round decimals to any place.	• 4.NBT.B.4	• 5.NBT.A.1 • 5.NBT.A.3	
5.NBT.B.5 ***(no fluency)*** Fluently multiply multi-digit whole numbers using the standard algorithm.	• 4.NBT.A.2 • 4.NBT.B.5	• 5.NBT.A.1	• 5.NBT.A.2 • 5.NBT.B.7
5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.		• 5.NBT.A.5 *(no fluency)*	
5.NBT.B.6 ***(3-digit dividends)*** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	• 4.NBT.B.4 • 4.NBT.B.6	• 5.NBT.A.1 • 5.NBT.B.5 *(no fluency)*	
5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.		• 5.NBT.B.5 • 5.NBT.B.6 *(3-digit dividends)*	• 5.NBT.B.7 *(no concrete)*
5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	• 4.NBT.B.4	• 5.NBT.A.1 • 5.NF.A.1 • 5.NF.B.4	• 5.NBT.A.2 • 5.NBT.B.5 *(no fluency)* • 5.NBT.B.6 *(3-digit dividends)*
5.NBT.B.7 ***(no concrete)*** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.		• 5.NBT.B.7 • 5.NF.B.4 • 5.NF.B.7	• 5.NBT.B.5 • 5.NBT.B.6

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.NF.A. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, ⅔ + ¾ = ⁸⁄₁₂ + ¹⁵⁄₁₂ = ²³⁄₁₂. (In general, a/b + c/d = (ad + bc)/bd.)*	• 4.NF.A.1 • 4.NF.B.3a • 4.NF.B.3b • 4.NF.B.3c • 4.NF.B.3d		
5.NF.A.2 (no estimation) Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result ⅖ + ½ = ³⁄₇, by observing that ³⁄₇ < ½.*	• 4.NF.A.2	• 5.NF.A.1	
5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result ⅖ + ½ = ³⁄₇, by observing that ³⁄₇ < ½.*		• 5.NF.A.2 *(no estimation)*	
5.NF.B.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret ¾ as the result of dividing 3 by 4, noting that ¾ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size ¾. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*	• 3.OA.A.1 • 3.OA.A.2 • 3.OA.B.6 • 4.OA.A.1 • 4.OA.A.2 • 4.MD.A.2		• 5.NF.B.4a (a/b X n) • 5.NF.B.5
5.NF.B.4a (a/b X n) Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (⅔) × 4 = ⁸⁄₃, and create a story context for this equation. Do the same with (⅔) × (⅕) = ⁸⁄₁₅. (In general, (a/b) × (c/d) = ac/bd.)*	• 3.MD.C.7b • 4.NF.B.4		• 5.NF.B.3 • 5.NF.B.6 (a/b X n)

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. *For example, use a visual fraction model to show* $(2/3) \times 4 = 8/3$*, and create a story context for this equation. Do the same with* $(2/3) \times (4/5) = 8/15$*. (In general,* $(a/b) \times (c/d) = ac/bd$*.)* b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.		• 5.NF.B.4a *(a/b X n)*	• 5.NF.B.6 *(no mixed numbers)* • 5.NF.B.7
5.NF.B.5 Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.	• 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 4.NF.A.1 • 4.MD.A.2	• 5.NF.B.4	• 5.OA.A.2 • 5.NF.B.3 • 5.NF.B.6 *(no mixed numbers)*
5.NF.B.6 *(a/b X n)* Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	• 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 4.MD.A.2		• 5.NF.B.4a *(a/b X n)*
5.NF.B.6 *(no mixed numbers)* Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.		• 5.NF.B.6 *(a/b X n)*	• 5.NF.B.4 • 5.NF.B.5
5.NF.B.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.		• 5.NF.B.6 *(no mixed numbers)*	• 5.NF.B.7

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.**1** a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (⅓) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (⅓) ÷ 4 = 1/12 because (1/12) × 4 = ⅓.* b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (⅕), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (⅕) = 20 because 20 × (⅕) = 4.* c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share ½ lb of chocolate equally? How many ⅓-cup servings are in 2 cups of raisins?*	• 3.OA.B.6 • 3.NF.A.1 • 4.NF.B.4		• 5.NF.B.4 • 5.NF.B.6
5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	• 4.MD.A.1 • 4.MD.A.2	• 5.NBT.B.7 *(no concrete)*	
5.MD.B.2 Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*	• 4.MD.B.4	• 5.NF.A.2 • 5.NF.B.6 • 5.NF.B.7c	
5.MD.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 which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.	• 3.MD.C.5		
5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.		• 5.MD.C.3	
5.MD.C.5a Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.	• 3.OA.B.5 • 4.MD.A.3	• 5.MD.C.3 • 5.MD.C.4	

5th Grade Standard	Previous Grade Standards	5th Gr. Stand. Taught in Advance	5th Gr. Stand. Taught Concurrently
5.MD.C.5b Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.		• 5.MD.C.5a	
5.MD.C.5c Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.		• 5.MD.C.3 • 5.MD.C.5b	
5.G.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 the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).	• 3.NF.A.2		• 5.G.A.2
5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	• 3.NF.A.2		• 5.G.A.1
5.G.B.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*	• 3.G.A.1 • 4.G.A.2		
5.G.B.4 Classify two-dimensional figures in a hierarchy based on properties.		• 5.G.B.3	

5th Grade Tasks At a Glance

There are 10 sample tasks included in this guidebook that can be used to supplement any curriculum.

The tasks for fifth grade include:

- **5 Extended Constructed Response (ECR):** These short tasks, aligned to the standards, mirror the extended constructed response items students will see on their end of year state assessments.
- **5 Instructional Tasks (IT):** These complex tasks are meant to be used for instruction and assessment. They will likely take multiple days for students to complete. They can be used to help students explore and master the full level of rigor demanded by the standards. Teachers can use the table below to find standards associated with current instruction and add in these practice items to supplement any curriculum. These tasks should be used after students have some initial understanding of the standards. They will help students solidify and deepen their understanding of the associated content.

This is an overview of the fifth grade tasks included on the following pages.

Title	Type	Task Standards	Task Remedial Standards
Hair-Coloring Solution Page 171	ECR	• 5.NBT.B.7 • 5.MD.A.1	• 4.NBT.B.4 • 4.MD.A.1 • 4.MD.A.2 • 5.NBT.A.1 • 5.NF.A.1 • 5.NF.B.4
Baking Cakes Page 176	ECR	• 5.NF.B.6 • 5.NF.B.7c	• 3.OA.A.1 • 3.OA.A.2 • 3.OA.B.6 • 3.NF.A.1 • 4.OA.A.1 • 4.OA.A.2 • 4.NF.B.4 • 4.MD.A.2
Dairy Farm Page 180	ECR	• 5.NBT.B.6 • 5.MD.A.1	• 4.NBT.B.4 • 4.NBT.B.6 • 4.MD.A.1 • 4.MD.A.2 • 5.NBT.A.1 • 5.NBT.B.5 • 5.NBT.B.7

Title	Type	Task Standards	Task Remedial Standards
The Tasty Deli Page 185	ECR	• 5.OA.A.2 • 5.NBT.B.6 • 5.NBT.B.7 • 5.MD.A.1	• K.OA • 1.OA • 2.OA • 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 4.NBT.B.4 • 4.NBT.B.6 • 5.OA.A.1 • 5.NBT.A.1 • 5.NBT.B.5 • 5.NF.A.1 • 5.NF.B.4 • 4.MD.A.1 • 4.MD.A.2
Milk and Cookies Page 192	ECR	• 5.NF.A.1 • 5.NF.A.2	• 4.NF.A.1 • 4.NF.A.2 • 4.NF.B.3
Fish Tanks Page 197	IT	• 5.MD.C.4 • 5.MD.C.5	• 3.OA.B.5 • 4.MD.A.3 • 5.MD.C.3
Number Cards Page 202	IT	• 5.NBT.A.3 • 5.NBT.A.4	• 4.NBT.A.3 • 4.NBT.B.4 • 4.NF.B.7 • 5.NBT.A.1
Dixieland Ranch Page 209	IT	• 5.NBT.B.5 • 5.NBT.B.6 • 5.MD.A.1	• 4.NBT.A.2 • 4.NBT.B.5 • 4.MD.A.1 • 4.MD.A.2 • 5.NBT.A.1
Rainfall Amounts Page 217	IT	• 5.NF.A.1 • 5.NF.A.2	• 4.NF.A.1 • 4.NF.A.2 • 4.NF.B.3
Colored Jugs Page 224	IT	• 5.NF.A.2 • 5.NF.B.4a • 5.NF.B.6 • 5.NF.B.7c	• 3.OA.A.1 • 3.OA.A.2 • 3.OA.B.6 • 3.NF.A.1 • 3.MD.C.7b • 4.NF.A.2 • 4.NF.B.4 • 4.OA.A.1 • 4.OA.A.2 • 4.MD.A.2 • 5.NF.A.1

Hair-Coloring Solution (ECR)

Overview

Students will apply the four operations with decimals to determine the amount of hair-coloring solution a shop owner will make in milliliters and in liters.

Standards

Perform operations with multi-digit whole numbers and with decimals to hundredths.

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

Convert like measurement units within a given measurement system.

5.MD.A.1 Convert among different-size standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multistep real-world problems.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NBT.B.7	• 4.NBT.B.4 • 5.NBT.A.1 • 5.NF.A.1 • 5.NF.B.4	1. Add 243.98 + 76.08 + 43.2. a. 363.26 2. Subtract 1,132.75 – 342.6. a. 790.15 3. Multiply 643.98 x 4. a. 2,575.92 4. http://www.illustrativemathematics.org/illustrations/1293	• http://www.illustrativemathematics.org/illustrations/1562 • http://www.illustrativemathematics.org/illustrations/861 • http://www.illustrativemathematics.org/illustrations/855 • http://www.illustrativemathematics.org/illustrations/321 • http://www.illustrativemathematics.org/illustrations/965 • http://learnzillion.com/lessonsets/229-multiply-and-divide-by-decimals-to-the-hundredths • http://learnzillion.com/lessonsets/189-adding-and-subtracting-decimals-to-hundredths
5.MD.A.1	• 4.MD.A.1 • 4.MD.A.2	1. Convert 6,203 mL to liters. a. 6.203 liters	• http://www.illustrativemathematics.org/illustrations/1508

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		2. Convert 23 liters to mL. a. 23,000 mL 3. http://www.illustrativemathematics.org/illustrations/293	• http://www.illustrativemathematics.org/illustrations/873 • http://learnzillion.com/lessonsets/697-convert-measurement-units-and-solve-real-world-problems • http://learnzillion.com/lessonsets/548-convert-among-differentsized-measurement-units-and-use-these-conversions-to-solve-realworld-problems

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a hair salon?** A hair salon is a place people go to have someone cut, style, or color their hair.
- **What is hair-coloring solution?** Hair-coloring solution is a mixture of different chemicals and colors that can be applied to hair in order to dye the hair a different color.
- **What is one application of solution?** One application of solution is the amount of solution it would typically take to dye one person's hair.

After the Task

For problem 1, students may not use place value precisely to add the amounts. Discuss with students the place value of each of the digits in the numbers. Guide students to use their understanding of four-tenths as a fraction to determine the equivalent fraction in hundredths in order to write the decimal 0.4 as 0.40. Then have students add the three amounts again using the correct place value.

For problem 2, students may understand that division is the necessary operation. However, division of decimals by a 3-digit divisor using the standard algorithm is not required at this grade. Guide students to use the relationship between multiplication and division to begin working the problem. Students only need to be able to find the whole number of application bottles that will be filled with the solution. Students can use their understanding of place value as well as their skill in multiplying multi-digit numbers to find the answer.

For problem 3, students may find the number of application bottles they can fill with the given amount of solution or how much of the solution would be divided evenly among 16 bottles. Encourage students to read the problem closely to identify the given information and the information they need to find. Ask probing questions to help students understand that they will first need to determine how much solution will be in 16 bottles if they are all filled completely. In part b, if students simply "move the decimal" to get the correct answer, discuss with them the math behind "moving the decimal" and have them write a mathematical equation to represent the conversion.

Student Extended Constructed Response

Jenny owns three hair salons and is making hair-coloring solution for use in all of her salons. To make the solution, she combines three colors using the amounts listed in the table below.

Color	Amount
Color A	311.25 mL
Color B	150.17 mL
Color C	90.4 mL

1. How many milliliters of the solution will be made? Show your calculations.

2. Jenny made more than one batch of the solution and has a total of 1,103.64 mL of the solution. She wants to pour the solution into application bottles so that there is one application per bottle. Each application bottle holds 135 mL of solution.
    a. How many application bottles can Jenny fill completely? Explain your reasoning.

    b. How many milliliters will be left after as many application bottles as possible have been completely filled with the solution Jenny made? Show how you found your answer.

3. Jenny has a recipe for a different hair-coloring solution that makes 575.48 mL in one batch. Jenny is going to ship this hair-coloring solution in single-application bottles to her other salons. Each shipping box can hold 16 application bottles, which hold 135 mL each.
    a. How many batches of the solution will Jenny need to make to completely fill 16 single-application bottles? Explain your reasoning.

    b. How many liters of the solution will be packed into one box? Show your calculations.

Extended Constructed Response Exemplar Response

Jenny owns three hair salons and is making hair-coloring solution for use in all of her salons. To make the solution, she combines three colors using the amounts listed in the table below.

Color	Amount
Color A	311.25 mL
Color B	150.17 mL
Color C	90.4 mL

1. How many milliliters of the solution will be made? Show your calculations.

   311.25
   + 150.17
   + 90.40
   551.82

   There will be 551.82 mL of the solution made.

2. Jenny made more than one batch of the solution and has a total of 1,103.64 mL of the solution. She wants to pour the solution into application bottles so that there is one application per bottle. Each application bottle holds 135 mL of solution.
   a. How many application bottles can Jenny fill completely? Explain your reasoning.

      I need to divide 1,103.64 by 135. I know that it's less than 10 because if I multiply 135 by 10, I get 1350, which is too much. So I tried 135 x 9, which is 1,215. That's still too much, so I tried 135 x 8 = 1,080. Jenny could put 1,080 mL of the 1,103.64 mL in 8 application bottles.

   b. How many milliliters will be left after as many application bottles as possible have been completely filled with the solution Jenny made? Show how you found your answer.

      1,103.64 – 1,080 = (1,103 – 1,080) + 0.64 = 23 + 0.64 = 23.64

      There would be 23.64 mL left of the solution Jenny made.

      ***Note: Students who have correct work based on an incorrect answer in part a should be given credit.*

3. Jenny has a recipe for a different hair-coloring solution that makes 575.48 mL in one batch. Jenny is going to ship this hair-coloring solution in single-application bottles to her other salons. Each shipping box can hold 16 application bottles, which hold 135 mL each.
   a. How many batches of the solution will Jenny need to make to completely fill 16 single-application bottles? Explain your reasoning.

      If Jenny needs to fill 16 bottles, she needs to make 16 x 135 = 2,160 mL of solution. One batch of this solution makes 575.48 mL. 575.48 x 2 = 1,150.96 mL made in two batches. 575.48 x 3 = 1,726.44 mL, and that isn't enough to fill all 16 bottles. 575.48 x 4 = 2,301.92 mL made in 4 batches. This is more than what she needs, but since three batches isn't enough, Jenny must make 4 batches of the solution to fill all 16 bottles.

b. How many liters of the solution will be packed into one box? Show your calculations.

16 bottles x 135 mL = 2,160 mL

$2{,}160 \div 1000 = 2.160$ *liters; there will be 2.160 liters in the box (2.16 is also acceptable).*

***Note: Students with correct work based on an incorrect answer in part a should be given credit.*

Baking Cakes (ECR)

Overview

Students will use multiplication and division of fractions to solve problems involving fractions of cakes.

Standards

Apply and extend previous understandings of multiplication and division.

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

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

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.B.6	• 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 4.MD.A.2	1. Kristina has $\frac{3}{8}$ of a pizza left from the night before. She gave $\frac{1}{2}$ of what she had left to her brother. What fraction of the whole pizza did Kristina give her brother? a. $\frac{3}{16}$ 2. http://www.illustrativemathematics.org/illustrations/294 3. http://www.illustrativemathematics.org/illustrations/295	• http://www.illustrativemathematics.org/illustrations/1531 • http://www.illustrativemathematics.org/illustrations/1540 • http://www.illustrativemathematics.org/illustrations/263 • http://www.illustrativemathematics.org/illustrations/873 • http://learnzillion.com/lessonsets/538-solve-problems-involving-multiplication-of-fractions-and-mixed-numbers • http://learnzillion.com/lessonsets/67-multiply-fractions-and-mixed-numbers

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.B.7c	• 3.OA.B.6 • 3.NF.A.1 • 4.NF.B.4	1. Hector has 2 cups of the yogurt that he eats for breakfast. If a serving of this yogurt is $\frac{1}{3}$ cup, how many mornings can Hector eat the yogurt for breakfast if he only eats one serving each morning? a. 6 mornings 2. http://www.illustrativemathematics.org/illustrations/1120	• http://www.illustrativemathematics.org/illustrations/833 • http://www.illustrativemathematics.org/illustrations/857 • http://learnzillion.com/lessonsets/737-divide-whole-numbers-by-unit-fractions-and-unit-fractions-by-whole-numbers

After the Task

For problem 1, students may have difficulty writing an equation to represent the situation. Ask students, "If $\frac{2}{3}$ of half of the cake is covered in sprinkles, what fraction of that half of the cake does not have sprinkles?" Have students translate the expression "$\frac{1}{3}$ of $\frac{1}{2}$ of the cake" into a mathematical expression using multiplication. Then repeat the process with the chocolate side of the cake. Guide students to write an addition equation using the multiplication expressions they created to represent the solution to the problem.

For problem 2, students might divide 7 by 5 rather than divide each of the seven cakes into five pieces. Have students create a drawing of the seven cakes and draw the slices on each cake. After students count the pieces of the cake that would be created, ask student to represent their drawing with a mathematical equation. Guide them to see that drawing the slices on the cake is dividing the cake into fifths; to find the answer, they can multiply 7 by 5.

Student Extended Constructed Response

1. Monica works at a bakery and is making a large rectangular cake. The customer requested that half of the cake be frosted with vanilla icing, and the other half be frosted with chocolate icing. The customer also wants sprinkles on $\frac{2}{3}$ of the vanilla half, and on $\frac{1}{4}$ of the chocolate half.
    a. Draw a picture of the rectangular cake, showing which parts have vanilla icing, chocolate icing, and sprinkles.

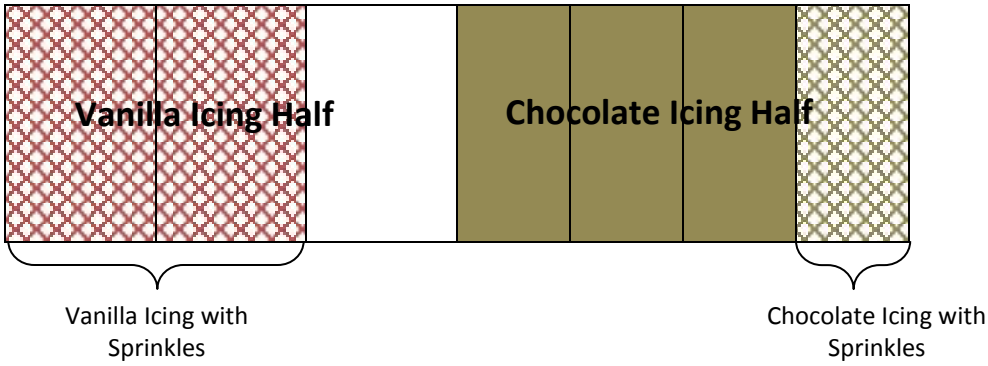
    b. Write and solve an equation to find the fraction of the cake that does **not** have sprinkles.

2. Monica is baking seven cakes that are all the same size. She will slice the cakes into equal pieces and sell the slices to customers in her store.
    a. One slice of each of these cakes is $\frac{1}{5}$ of the cake. How many slices of cake will Monica be able to sell? Show your work using words and/or pictures.

    b. Monica sold $\frac{4}{5}$ of the slices that she cut in part a. How many slices of cake did Monica sell? Show your calculations.

Extended Constructed Response Exemplar Response

1. Monica works at a bakery and is making a large rectangular cake. The customer requested that half of the cake be frosted with vanilla icing, and the other half be frosted with chocolate icing. The customer also wants sprinkles on $\frac{2}{3}$ of the vanilla half and on $\frac{1}{4}$ of the chocolate half.
    a. Draw a picture of the rectangular cake, showing which parts have vanilla icing, chocolate icing, and sprinkles.



    b. Write and solve an equation to find the fraction of the cake that does **not** have sprinkles.

$\frac{1}{3} \times \frac{1}{2} + \frac{3}{4} \times \frac{1}{2} = ?$ *? is the fraction of the cake without sprinkles*

$\frac{1}{6} + \frac{3}{8} = ?$

$\frac{4}{24} + \frac{9}{24} = ?$

$\frac{13}{24} = ?$

$\frac{13}{24}$ *of the cake will not have sprinkles.*

2. Monica is baking seven cakes that are all the same size. She will slice the cakes into equal pieces and sell the slices to customers in her store.
    a. One slice of each of these cakes is $\frac{1}{5}$ of the cake. How many slices of cake will Monica be able to sell? Show your work using words and/or pictures.

    If Monica cuts one cake into fifths, there are 5 equal pieces. If she cuts seven cakes so that each cake has 5 equal pieces, then there would be 35 pieces because 7 x 5 = 35.

    b. Monica sold $\frac{4}{5}$ of the slices that she cut in part a. How many slices of cake did Monica sell? Show your calculations.

$\frac{4}{5} \times 35 = \frac{140}{5} = 28$ *Monica sold 28 pieces of the cake.*

***Note: Students with correct work based on an incorrect response in part a should be given credit.*

Dairy Farm (ECR)

Overview

Students will use division and measurement conversion to answer questions about milk production on a dairy farm.

Standards

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Convert like measurement units within a given measurement system.

5.MD.A.1 Convert among different-size standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multistep real-world problems.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NBT.B.6	• 4.NBT.B.4 • 4.NBT.B.6 • 5.NBT.A.1 • 5.NBT.B.5	1. Divide $1290 \div 6$. a. 215 2. Divide $1476 \div 36$. a. 41	• http://www.illustrativemathematics.org/illustrations/1774 • http://www.illustrativemathematics.org/illustrations/1562 • http://www.illustrativemathematics.org/illustrations/1800 • http://www.illustrativemathematics.org/illustrations/1799 • http://learnzillion.com/lessonsets/211-find-whole-number-quotients-with-up-to-4digit-dividends-and-2digit-divisors
5.MD.A.1	• 4.MD.A.1 • 4.MD.A.2 • 5.NBT.B.7	1. Convert 36 quarts to gallons. a. 9 gallons 2. Convert 14 quarts to pints. a. 28 pints 3. http://www.illustrativemathematics.org/illustrations/878	• http://www.illustrativemathematics.org/illustrations/1508 • http://www.illustrativemathematics.org/illustrations/873 • http://www.illustrativemathematics.org/illustrations/1293 • http://learnzillion.com/lessonsets/697-

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
			convert-measurement-units-and-solve-real-world-problems • http://learnzillion.com/lessonsets/548-convert-among-differentsized-measurement-units-and-use-these-conversions-to-solve-realworld-problems

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a dairy farm?** A dairy farm is a farm where cows are raised to make milk and milk products, including cheese, ice cream, butter, and whipping cream.
- **What is a distributor?** A distributor is a person or company that distributes goods to various stores to be sold to consumers.

During the Task

- Students should be allowed to use the PARCC Assessment Reference Sheet[1] for Grade 5 to complete this task.

After the Task

For problem 1, students might find the number of gallons per cow or the number of gallons per day rather than the number of gallons per cow per day. Remind students that when they get one answer, that does not mean they are finished solving the problem. Have students read the problem closely and identify what the problem is asking them to find. Discuss with students what their next step should be to solve the problem.

[1] http://parcconline.org/sites/parcc/files/ApprovedPARCCReferenceSheet__081712.pdf

Student Extended Constructed Response

Lorenzo's class visits a dairy farm to learn about milk production. They learn that the 25 cows on the farm must be milked twice per day (every morning and evening). Together, the cows produce 1,050 gallons of milk per week.

1. How much milk does each cow produce in one day? Show your calculations, and be sure to include units.

2. The farm keeps 20 gallons of the milk produced each day to use on the farm and sells the rest of the milk to a distributor to be sold in stores. The farm packages 10 gallons of the milk it keeps into gallon containers. The remaining 10 gallons are divided so that 5 gallons will be divided among one-quart containers, and 5 gallons will be divided among one-pint containers.

    a. Find the number of one-quart containers needed each day. Show your calculations.

    b. Find the number of one-pint containers needed each day. Show your calculations.

    c. Explain how you would find the number of one-quart and one-pint containers needed each **week**.

Extended Constructed Response Exemplar Response

Lorenzo's class visits a dairy farm to learn about milk production. They learn that the 25 cows on the farm must be milked twice per day (every morning and evening). Together, the cows produce 1,050 gallons of milk per week.

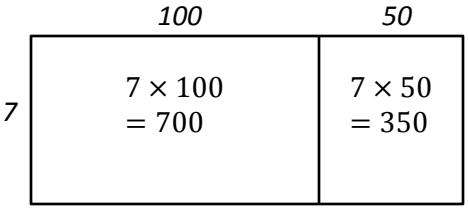
1. How much milk does each cow produce in one day? Show your calculations, and be sure to include units.

   $1050 \div 7 = ?$, so $7 \times ? = 1050$

   $7 \times 100 = 700$

   $7 \times 50 = 350$

   So, $7 \times 150 = 1050$.

   There are 150 gallons of milk produced each day.

   $150 \div 25 = ?$, so $25 \times ? = 150$

   $25 \times 4 = 100$

   $25 \times 2 = 50$

   So, $25 \times 6 = 150$. *This means each cow produces 6 gallons of milk each day.*

2. The farm keeps 20 gallons of the milk produced each day to use on the farm and sells the rest of the milk to a distributor to be sold in stores. The farm packages 10 gallons of the milk it keeps into gallon containers. The remaining 10 gallons are divided so that 5 gallons will be divided among one-quart containers, and 5 gallons will be divided among one-pint containers.

   a. Find the number of one-quart containers needed each day. Show your calculations.

      5 gallons x 4 quarts per gallon = 20 quarts

      20 one-quart containers will be needed.

   b. Find the number of one-pint containers needed each day. Show your calculations.

      1 quart = 2 pints and 4 quarts = 1 gallon, so 1 gallon = 4 quarts x 2 pints per quart = 8 pints

      5 gallons x 8 pints per gallon = 40 pints

      40 one-pint containers will be needed.

      ***Note: Students might also convert the five gallons to quarts first, then to pints. They may also recognize that they can use the answer from part a, and multiply by 2 to get the number of pints. Both alternate methods are acceptable.*

c. Explain how you would find the number of one-quart and one-pint containers needed each **week**.

To find the number of one-quart containers for the week, I would multiply the number of one-quart containers needed per day by 7 since there are seven days in the week. To find the number of one-pint containers needed for the week, I would multiply the number of one-pint containers needed for one day by 7 since there are seven days in the week.

The Tasty Deli (ECR)

Overview

Students will use the four operations with whole numbers and decimals to answer questions about the daily and weekly operations of a local sandwich shop.

Standards

Write and interpret numerical expressions.

5.OA.A.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognize that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.B.6 Find whole-number quotients with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

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

Convert like measurement units within a given measurement system.

5.MD.A.1 Convert among different-size standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use the conversions in solving multistep real-world problems.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.OA.A.2	• K.OA • 1.OA • 2.OA • 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 5.OA.A.1	1. Write an expression to represent "multiply 9 by 4, then add it to the product of 16 and 3." a. $9 \times 4 + 16 \times 3$ 2. http://www.illustrativemathematics.org/illustrations/556 3. http://www.illustrativemathematics.org/illustrations/590	• http://www.illustrativemathematics.org/illustrations/555 • http://www.illustrativemathematics.org/illustrations/969 • http://www.illustrativemathematics.org/illustrations/1596 • http://www.illustrativemathematics.org/illustrations/263 • http://learnzillion.com/lessonsets/648-write-

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
			interpret-describe-and-reason-about-expressions • http://learnzillion.com/lessonsets/614-write-and-interpret-expressions
5.NBT.B.6	• 4.NBT.B.4 • 4.NBT.B.6 • 5.NBT.A.1 • 5.NBT.B.5	1. Divide $7590 \div 22$. a. 345 2. http://www.illustrativemathematics.org/illustrations/878	• http://www.illustrativemathematics.org/illustrations/1562 • http://www.illustrativemathematics.org/illustrations/1800 • http://www.illustrativemathematics.org/illustrations/1799 • http://www.illustrativemathematics.org/illustrations/1774 • http://learnzillion.com/lessonsets/211-find-whole-number-quotients-with-up-to-4digit-dividends-and-2digit-divisors
5.NBT.B.7	• 4.NBT.B.4 • 5.NBT.A.1 • 5.NF.A.1 • 5.NF.B.4	1. Multiply 2.63 x 0.5. a. 1.315 2. Multiply 10.76 x 0.1. a. 1.076 3. http://www.illustrativemathematics.org/illustrations/1293	• http://www.illustrativemathematics.org/illustrations/321 • http://www.illustrativemathematics.org/illustrations/965 • http://www.illustrativemathematics.org/illustrations/1563 • http://learnzillion.com/lessonsets/229-multiply-and-divide-by-decimals-to-the-hundredths • http://learnzillion.com/lessonsets/189-adding-and-subtracting-decimals-to-hundredths
5.MD.A.1	• 4.MD.A.1 • 4.MD.A.2	1. How many ounces are in 9.25 pounds? a. 148 2. http://www.illustrativemathematics.org/illustrations/293	• http://www.illustrativemathematics.org/illustrations/1508 • http://www.illustrativemathematics.org/illustrations/873 • http://learnzillion.com/lessonsets/697-convert-measurement-units-and-solve-real-world-problems • http://learnzillion.com/lessonsets/548-convert-among-differentsized-measurement-units-and-use-these-conversions-to-solve-realworld-problems

During the Task

- Allow the students to use the PARCC Assessment Reference Sheet[2] for Grade 5 with this task to aid them with the conversions.

After the Task

Students may forget about the decimal when multiplying in problem 1. Have students make use of structure to rewrite 6.5 as 6 + 0.5 and use the distributive property to multiply to help them find the correct answer. Students should recognize 0.5 as being one-half, which can help with the multiplication.

When dividing for problem 1b, students may use the standard algorithm, partial quotients (as shown in the exemplar response), or the properties of operations. Have students think about what multiplication facts they know that can help them divide the given numbers. Students need to keep track of the factors they use in order to get the correct quotient.

For problem 2, students might disregard the extra 8 sandwiches in error. Ask students to find how many sandwiches the shop will be able to send using the number of boxes they found. Then compare that number to the order. Students should realize they need at least one more box.

Students do not have to use parentheses for the expression in problem 3. If students do not use parentheses and do not follow the correct order of operations when evaluating the expression, have them identify the order in which they would perform the calculations. Discuss with students how they can write the expression so that everyone will perform the same operations in the same order.

For problem 4, struggling students should draw a model of the cost of the turkey and use that model to find one-tenth of the cost. Help students see that the value of each digit changes because it moves one place to the right in the number when multiplied by one-tenth.

[2] http://parcconline.org/sites/parcc/files/ApprovedPARCCReferenceSheet__081712.pdf

Student Extended Constructed Response

1. The Tasty Deli uses 6.5 pounds of ham each day.
    a. How many ounces of ham will be used in three weeks? Use equations or pictures to show how you found your answer.

    b. Each ham sandwich the deli sells uses 13 ounces of ham. How many sandwiches can the deli make in three weeks? Show your work or explain your reasoning.

2. The deli delivers sandwiches for parties. Employees can pack 14 sandwiches in one box. If the deli has an order for 120 sandwiches, what is the minimum number of boxes required to deliver the order? Explain your reasoning.

3. The deli manager pays $1.59 per pound for turkey and $1.75 per pound for beef. Write an expression that shows how to calculate the amount of money the deli manager will spend if he buys 9 pounds of beef and 15 pounds of turkey. Use the expression you wrote to find the total amount the manager will spend.

4. Bologna costs $\frac{1}{10}$ as much per pound as turkey. Find the amount the deli manager will pay for 100 pounds of bologna. Explain how you found your answer.

Extended Constructed Response Exemplar Response

1. The Tasty Deli uses 6.5 pounds of ham each day.
    a. How many ounces of ham will be used in three weeks? Use equations or pictures to show how you found your answer.

    6.5 x 16 = 16 x (6 + 0.5) = (16 x 6) + (16 x 0.5) = 96 + 8 = 104; the shop uses 104 ounces of ham per day.

    There are 7 days in a week, so 104 x 7 = 728, so the shop uses 728 ounces per week.

    Then 728 x 3 = 2,184, so the shop uses 2,184 ounces in three weeks.

    b. Each ham sandwich the deli sells uses 13 ounces of ham. How many sandwiches can the deli make in three weeks? Show your work or explain your reasoning.

    In order to find the number of sandwiches, I have to find $2184 \div 13$*. I know that 13 x 100 = 1300, and 2184 – 1300 = 884. Next, I know that 13 x 10 = 130 and 130 x 3 = 390, so 13 x 30 = 390. 884 – 390 = 494. Since 494 is greater than 390, I can subtract 390 again. 494 – 390 = 104. Because the ones digit is a 4, and I know 3 x 8 = 24, I multiply 13 x 8 to find that it is 104. So*

    13 x 100 = 1300

    13 x 30 = 390

    13 x 30 = 390

    13 x 8 = 104

    100 + 30 + 30 + 8 = 168. So $2184 \div 13 = 168$*. The shop can make 168 sandwiches in three weeks with the 2,184 ounces of ham.*

    ***Note: If students show correct work using an incorrect answer from part a, they should be awarded credit. Also, the method shown uses the relationship between multiplication and division, properties of operations (associative property), and understanding of place value. Students may use other methods, such as the standard algorithm; students are not required to master the standard algorithm for division until grade 6. Students may also use an area model to show their reasoning.*

2. The deli delivers sandwiches for parties. Employees can pack 14 sandwiches in one box. If the deli has an order for 120 sandwiches, what is the minimum number of boxes required to deliver the order? Explain your reasoning.

    The shop needs a minimum of 9 boxes to ship out the order. $120 \div 14 = 8$ *with a remainder of 8. So, 8 boxes can be packed with 14 sandwiches each while a ninth box will be needed to pack the remaining 8 sandwiches.*

3. The deli manager pays $1.59 per pound for turkey and $1.75 per pound for beef. Write an expression that shows how to calculate the amount of money the deli manager will spend if he buys 9 pounds of beef and 15 pounds of turkey. Use the expression you wrote to find the total amount the manager will spend.

   $1.59 x 15 + $1.75 x 9

   $23.85 + $15.75 = $39.60

   The manager will spend $39.60 to buy the 9 pounds of beef and 15 pounds of turkey.

4. Bologna costs $\frac{1}{10}$ as much per pound as turkey. Find the amount the deli manager will pay for 100 pounds of bologna. Explain how you found your answer.

   Turkey costs $1.59 per pound. I can change $\frac{1}{10}$ to 0.1, and I can multiply $1.59 x 0.1. When I multiply each digit by 0.1, it will move one place to the right, so $1.59 x 0.1 = 0.159. That means that bologna will cost $0.16 per pound. That is the same as $\frac{16}{100}$. If the manager buys 100 pounds of bologna, I can multiply $\frac{16}{100} \times 100$, which gives 16 as the answer. That means the manager will pay $16 for 100 pounds of bologna.

Milk and Cookies (ECR)

Overview

Students will add and subtract fractions to determine how much milk and flour are used in one day on Mike's dairy farm.

Standards

Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12 (in general, a/b + c/d = (ad + bc)/bd.)*

5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result, 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.A.1	• 4.NF.A.1 • 4.NF.B.3	1. Add $\frac{1}{2}+\frac{3}{5}+\frac{3}{4}$. a. $\frac{37}{20}$ or $1\frac{17}{20}$ 2. Subtract $2\frac{7}{15}-\frac{3}{5}$. State the answer as a mixed number. a. $1\frac{13}{15}$ 3. http://www.illustrativemathematics.org/illustrations/839 4. http://www.illustrativemathematics.org/illustrations/847 5. http://www.illustrativemathematics.org/illustrations/848 6. http://www.illustrativemathematics.org/illustrations/859	• http://www.illustrativemathematics.org/illustrations/743 • http://www.illustrativemathematics.org/illustrations/881 • http://www.illustrativemathematics.org/illustrations/831 • http://www.illustrativemathematics.org/illustrations/837 • http://www.illustrativemathematics.org/illustrations/968 • http://learnzillion.com/lessonsets/536-add-and-subtract-fractions-and-mixed-numbers-with-unlike-denominators-using-fraction-bars • http://learnzillion.com/lessonsets/383-add-and-subtract-fractions-and-mixed-numbers-with-unlike-denominators-using-area-models • http://learnzillion.com/lessonsets/216-add-and-subtract-fractions-with-unlike-denominators • http://learnzillion.com/lessonsets/63-add-and-subtract-mixed-numbers

Grade Level Standards	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.A.2	• 4.NF.A.2	1. Otto walked $\frac{3}{8}$ mile more than Denis at the track today. Otto walked a total of $1\frac{1}{4}$ miles. How far did Denis walk? a. Denis walked $\frac{7}{8}$ mile. 2. http://www.illustrativemathematics.org/illustrations/481 3. http://www.illustrativemathematics.org/illustrations/1172	• http://www.illustrativemathematics.org/illustrations/812 • http://www.illustrativemathematics.org/illustrations/811 • http://www.illustrativemathematics.org/illustrations/183 • http://learnzillion.com/lessonsets/642-assess-the-reasonableness-of-answers-to-word-problems-involving-the-addition-and-subtraction-of-fractions • http://learnzillion.com/lessonsets/385-solve-word-problems-involving-the-addition-and-subtraction-of-fractions-with-unlike-denominators • http://learnzillion.com/lessonsets/223-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-2 • http://learnzillion.com/lessonsets/219-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-1 • http://learnzillion.com/lessonsets/64-add-and-subtract-fractions

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a dairy farm?** A dairy farm is a farm where cows are raised to make milk and milk products, including cheese, ice cream, butter, and whipping cream.

After the Task

For problem 1, students may have difficulty finding a common denominator for all three fractions. Remind students to apply the properties of operations and add two of the fractions first. Once they have added two of the fractions, students can add the result to the remaining fraction from the problem.

In problem 2, students who focus on translating key words into operations will likely use the incorrect operations for this portion of the task. Have students write equations with symbols or words for the unknown amounts. Once students find the values for the unknown amounts, ask them to read the problem again to determine if their answers are reasonable in the given context (e.g., the amount of flour used for the brownies is less than the amount used for the cake).

Problem 3 asks students to do two operations—addition, then subtraction. Some students may write an expression without parentheses and choose to work it out by adding first, then subtracting. Discuss with students the need to be precise when recording their work and in their calculations. Guide students to rewrite the expression using the parentheses or by using subtraction twice.

Student Extended Constructed Response

1. Mike collected milk from 3 of his cows at the dairy farm. From the first cow, he collected $\frac{4}{5}$ gallon of milk. The second cow produced $\frac{6}{8}$ gallon, and the last cow produced $\frac{3}{4}$ gallon.

    a. How many gallons of milk did Mike collect in all? Show how you found your answer. Write your answer as a mixed number.

    b. After using some of the milk he collected for baking, Mike found that he only had $\frac{5}{6}$ gallon of milk left. How much milk did he use for baking? Show how you found your answer.

2. Mike baked brownies, cookies, and cake for treats for the family and others working on the farm. He used $\frac{1}{8}$ pound less flour to make the cookies than he used to make the cake. He used $\frac{1}{4}$ pound more flour to make the cake than he used to make the brownies. If Mike used $\frac{1}{2}$ pound of flour to make the cake, how much flour did he use to make the brownies? How much flour did he use to make the cookies? Show how you found your answers.

3. With the remaining $\frac{5}{6}$ gallon of milk, Mike decided to make chocolate milk and strawberry milk for his children to have with their baked treats. He used $\frac{1}{3}$ gallon of milk for the chocolate milk and $\frac{1}{4}$ gallon of milk for the strawberry milk. How much regular milk was left? Show how you found your answer.

Extended Constructed Response Exemplar Response

1. Mike collected milk from 3 of his cows at the dairy farm. From the first cow, he collected $\frac{4}{5}$ gallon of milk. The second cow produced $\frac{6}{8}$ gallon, and the last cow produced $\frac{3}{4}$ gallon.

   a. How many gallons of milk did Mike collect in all? Show how you found your answer.

   $\frac{4}{5}+\frac{6}{8}+\frac{3}{4}=\frac{4}{5}+\left(\frac{6}{8}+\frac{6}{8}\right)=\frac{4}{5}+\frac{12}{8}=\frac{32}{40}+\frac{60}{40}=\frac{92}{40}=2\frac{12}{40}$

   Mike collected $2\frac{12}{40}$ *gallons of milk.*

   ***Note: Students may also provide* $2\frac{3}{10}$ *gallons as the answer. Other work is also acceptable.*

   b. After using some of the milk he collected for baking, Mike found that he only had $\frac{5}{6}$ gallon of milk left. How much milk did he use for baking? Show how you found your answer.

   $2\frac{3}{10}-\frac{5}{6}=2+\frac{3}{10}-\frac{5}{6}=\frac{3}{10}+\left(2-\frac{5}{6}\right)=\frac{3}{10}+1\frac{1}{6}=\frac{18}{60}+1\frac{10}{60}=1\frac{28}{60}$

   Mike used $1\frac{28}{60}$ *gallons for baking.*

   ***Note: Students may also give* $1\frac{7}{15}$ *gallons as the answer. Students who have correct work based on an incorrect answer in part a should also be given credit. There are other possible methods for arriving at this answer.*

2. Mike baked brownies, cookies, and cake for treats for the family and others working on the farm. He used $\frac{1}{8}$ pound less flour to make the cookies than he used to make the cake. He used $\frac{1}{4}$ pound more flour to make the cake than he used to make the brownies. If Mike used $\frac{1}{2}$ pound of flour to make the cake, how much flour did he use to make the brownies? How much flour did he use to make the cookies? Show how you found your answers.

   Cake = $\frac{1}{2}$ *pound of flour* *Cookies = Cake -* $\frac{1}{8}$ *Brownies = Cake -* $\frac{1}{4}$

   Cookies = $\frac{1}{2}-\frac{1}{8}=\frac{4}{8}-\frac{1}{8}=\frac{3}{8}$ *Mike used* $\frac{3}{8}$ *pound of flour to make the cookies.*

   Brownies = $\frac{1}{2}-\frac{1}{4}=\frac{2}{4}-\frac{1}{4}=\frac{1}{4}$ *Mike used* $\frac{1}{4}$ *pound of flour to make the brownies.*

3. With the remaining $\frac{5}{6}$ gallon of milk, Mike decided to make chocolate milk and strawberry milk for his children to have with their baked treats. He used $\frac{1}{3}$ gallon of milk for the chocolate milk and $\frac{1}{4}$ gallon of milk for the strawberry milk. How much regular milk was left? Show how you found your answer.

   $\frac{5}{6} - \left(\frac{1}{3} + \frac{1}{4}\right) = \frac{5}{6} - \left(\frac{4}{12} + \frac{3}{12}\right) = \frac{5}{6} - \left(\frac{7}{12}\right) = \frac{10}{12} - \frac{7}{12} = \frac{3}{12}$

   There is $\frac{3}{12}$ gallon of white milk left over.

   ***Note: Students may also give $\frac{1}{4}$ gallon for their answer. There are also other acceptable methods for the work.*

Fish Tanks (IT)

Overview

Students will use knowledge of volume to answer questions related to the volume of two fish tanks.

Standards

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

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

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

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

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

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.MD.C.4	• 5.MD.C.3	1. How many cubes fit in a rectangular prism that has a 5 cm length, a 2 cm width, and a 4 cm height? a. 40 cm cubes	• http://learnzillion.com/lessonsets/364-count-unit-cubes-to-measure-volume • http://learnzillion.com/lessons/1485-identify-and-label-threedimension-figures
5.MD.C.5	• 3.OA.B.5 • 4.MD.A.3 • 5.MD.C.3	1. Using the volume formula, what is the volume of a rectangular prism that has a length of 3 cm, a width of 10 cm, and a height of 5 cm? Show your work. a. V = 150 cm^3 2. http://www.illustrativemathematics.org/illustrations/1631 3. http://www.illustrativemathematics.org/illustrations/1308	• http://www.illustrativemathematics.org/illustrations/876 • http://learnzillion.com/lessonsets/365-relating-volume-to-the-operations-of-multiplication-and-addition • http://learnzillion.com/lessonsets/284-understand-volume-as-an-attribute-of-threedimensional-figures-measure-volume-by-counting-unit-cubes-relate-volume-to-multiplication-and-addition

During the Task:

- If students are having difficulty drawing the rectangular prism to model the fish tanks, provide them with centimeter grid paper or a computer program, like a word processing program, to allow them to draw the figure.
- Provide students with centimeter cubes or inch cubes that they can use to build a model of the fish tanks to determine the number of inch cubes that can be packed inside of the fish tanks they have drawn.
- Students may have difficulty with reasonable sizes for the fish tank. It may be beneficial to show them a concrete model as a reference.
- Some students may struggle when trying to determine if Lizzie's fish tank will always have a greater volume or if the two tanks can have the same volume. Have students share their drawings with each other to see if anyone in the class has created a model in which Lizzie's tank would have a lesser volume than Lonnie's. Encourage students to use the inch cubes to help answer questions 5 and 6. Have students share their process with the class as they explain their reasoning.

After the Task:

To connect this to the students' lives, two different-sized small fish tanks could be set up with class pets. The students could measure the tanks and discuss the volumes of the tanks. This could lead to filling the tanks with water and comparing the amount of water it took to fill them.

Student Instructional Task

Lizzie and Lonnie are twins. Each of the twins has a small fish tank in her own bedroom big enough for one goldfish. The fish tanks are rectangular prisms. Lizzie's fish tank is longer and wider than Lonnie's fish tank, but Lonnie's tank is taller than Lizzie's.

1. Draw an example of what each of their fish tanks could look like. Include example dimensions in inches for your drawings and label each.

2. Using your drawings, give the volume of each fish tank by stating how many 1-inch unit cubes can be packed into each.

3. Show how the volume formula can be used to find the volume of each fish tank.

4. What is the combined volume of the two fish tanks? Explain how you found the combined volume.

5. Lizzie says "Because my tank is longer and wider, it will always have a larger volume than Lonnie's tank." Is this true? Explain your reasoning.

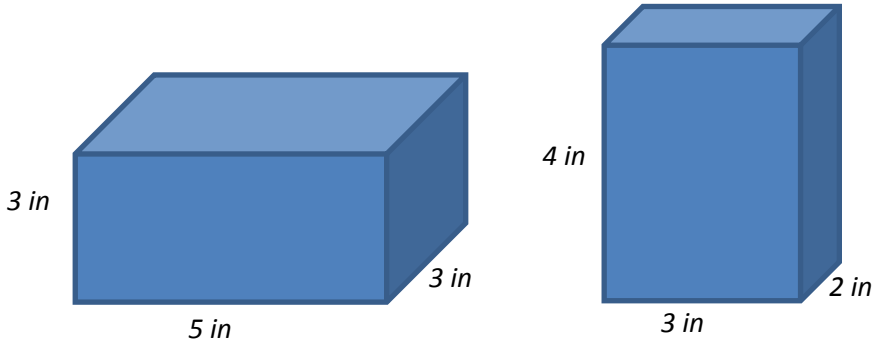
6. Is it possible for the two fish tanks to have the same volume if Lizzie's tank is always longer and wider and Lonnie's tank is always taller? Explain your reasoning. Use drawings to support your explanation.

Instructional Task Exemplar Response

Lizzie and Lonnie are twins. Each of the twins has a small fish tank in her own bedroom big enough for one goldfish. The fish tanks are rectangular prisms. Lizzie's fish tank is longer and wider than Lonnie's fish tank, but Lonnie's tank is taller than Lizzie's.

1. Draw an example of what each of their fish tanks could look like. Include example dimensions in inches for your drawings and label each.

   Sample answer: (not drawn to scale)



Lizzie's fish tank *Lonnie's fish tank*

2. Using your drawings, give the volume of each fish tank by stating how many 1-inch unit cubes can be packed into each**.**

   Sample answer based on the sample figures:

   Lizzie's fish tank would hold 45 1-inch unit cubes. Lonnie's fish tank would hold 24 1-inch unit cubes.

3. Show how the volume formula can be used to find the volume of each fish tank.

   Sample answer based on the sample figures:

   Volume can also be found by using the volume formula, V = l x w x h. For Lizzie's, 5 in x 3 in x 3 in, which is 45 in^3. For Lonnie's, 3 in x 2 in x 4 in, which is 24 $in.^3$.

4. What is the combined volume of the two fish tanks? Explain how you found the combined volume.

   Sample answer based on the sample figures:

   45 in^3 + 24 in^3 = 69 in^3

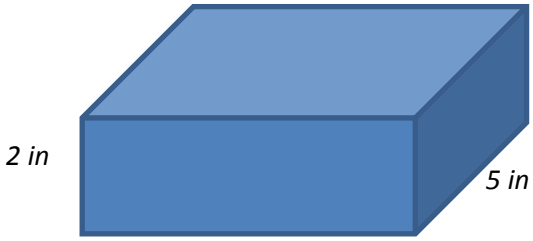
   To find the combined volume, I added the volume of Lizzie's tank to the volume of Lonnie's tank.

5. Lizzie says "Because my tank is longer and wider, it will always have a larger volume than Lonnie's tank." Is this true? Explain your reasoning.

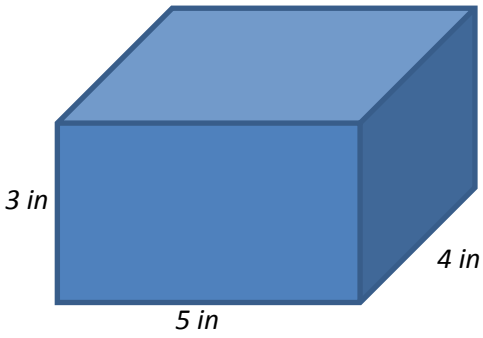
   It is not true. For example, Lizzie could have a tank that has a length of 6 in, a width of 5 in, and a height of 2 in with a volume of 60 in^3. Lonnie could have a tank that has a length of 5 in, a width of 4 in, and a height of 4 in with a volume of 80 in^3.

6. Is it possible for the two fish tanks to have the same volume if Lizzie's tank is always longer and wider and Lonnie's tank is always taller? Explain your reasoning. Use drawings to support your explanation.

Yes, it is possible for the two tanks to have the same volume. For example, Lizzie could have a tank that has a length of 6 in, a width of 5 in, and a height of 2 in with a volume of 60 in^3. Lonnie could have a tank that has a length of 5 in, a width of 4 in, and a height of 3 in with a volume of 60 in^3.



Lizzie's fish tank



Lonnie's fish tank

Number Cards (IT)

Overview

Students will create decimal numbers using cards numbered 0-9. Students will compare and order the numbers, round the numbers to the nearest hundredth, and write the numbers in various forms.

Standards

Understand the place value system.

5.NBT.A.3 Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392=3 x 100 +4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000).
b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of the comparisons.

5.NBT.A.4 Use place value understanding to round decimals to any place.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NBT.A.3	• 4.NBT.A.3 • 4.NF.B.7 • 5.NBT.A.1	1. Write the word form of 112.5. a. one hundred twelve and five-tenths 2. Which is larger 256.34 or 25.63? a. 256.34 is larger. 3. http://www.illustrativemathematics.org/illustrations/1813 4. http://www.illustrativemathematics.org/illustrations/1801	• http://www.illustrativemathematics.org/illustrations/1807 • http://www.illustrativemathematics.org/illustrations/182 • http://www.illustrativemathematics.org/illustrations/1562 • http://learnzillion.com/lessonsets/735-read-and-write-decimals-to-thousandths-using-baseten-numerals • http://learnzillion.com/lessonsets/638-read-and-write-decimals-to-the-thousandths • http://learnzillion.com/lessonsets/134-read-and-write-decimals-to-the-thousandths-in-numeric-word-and-expanded-form • http://learnzillion.com/lessonsets/234-compare-two-decimals-to-thousandths-using-and-

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NBT.A.4	• 4.NBT.B.4 • 5.NBT.A.1 • 5.NBT.A.3	1. Round 358.75 to the nearest tenths. a. 358.8 2. Round 255.1 to the nearest ones. a. 255 3. Round 1563.785 to the nearest thousandths. a. 1563.79	• http://www.illustrativemathematics.org/illustrations/1800 • http://www.illustrativemathematics.org/illustrations/1799 • http://learnzillion.com/lessonsets/416-round-decimals-to-any-place • http://learnzillion.com/lessonsets/212-round-decimals-to-any-place-using-number-lines

During the Task:

- Students may have difficulty comparing the numbers they have created. Grid paper may be helpful in lining up the decimals in order to compare the place values.
- When writing the decimal numbers in expanded form, students may attempt to use 0.1, 0.01, and 0.001 instead of the fractions. Encourage students to change the decimal form to the fraction when writing in expanded form.
- Have students exchange the lists they created for problem 1 to critique each other's reasoning of how they ordered the numbers before proceeding to problem 2. This will help students identify what is incorrect with the reasoning provided in problem 2.

After the Task:

Give students the opportunity to play an actual card game with numeral and decimal cards. Have students randomly pick six numeral cards from their stacks. Then challenge students to make the largest number possible with a given number of places after the decimal or the smallest number with a given number of places after the decimal.

Student Instructional Task

Lottie's teacher put the students in her class into groups and gave each group a stack of cards like the ones pictured below.

1. Each group had to create 3 different numbers using the decimal card **and** any 6 of the numeral cards. Each number the group created had to be to a different place value after the decimal (tenths, hundredths, thousandths). Groups randomly chose six numeral cards for each number they created.

    a. Write 3 numbers that Lottie's group could have created.

    b. Put the 3 numbers from *part a* in order from greatest to least. Explain how you decided the order of the numbers.

    c. Write the numbers created in *part a* in expanded form.

2. When the groups finished, they swapped lists of numbers. Lottie's group received the following list of numbers ordered from greatest to least with an explanation.

> 756.208
> 6981.92
> 46231.5
>
> We put these in order using the first digit because all of our numbers have six digits.

a. Explain why the group's reasoning in the box above is incorrect.

b. Write the numbers from the list Lottie's group received in the correct order. Explain how you know that you are correct.

c. Using >, =, or <, compare the number with the greatest value from problem 2c to the number with the greatest value from problem 1b.

d. Write your inequality from problem 2d using the number names and words instead of numerals and symbols.

e. Write the 3 numbers from the list Lottie's group received as amounts of money. Explain why the numbers had to change and what you did to change them.

Instructional Task Exemplar Response

Lottie's teacher put the students in her class into groups and gave each group a stack of cards like the ones pictured below.

1. Each group had to create 3 different numbers using the decimal card **and** any 6 of the numeral cards. Each number the group created had to be to a different place value after the decimal (tenths, hundredths, thousandths). Groups randomly chose six numeral cards for each number they created.

    a. Write 3 numbers that Lottie's group could have created.

    Sample response:

    512.430
    2831.45
    83029.7

    b. Put the 3 numbers from *part a* in order from greatest to least. Explain how you decided the order of the numbers.

    Sample response based on part a:

    83029.7
    2831.45
    512.430

    Each numeral has a different number of digits in front of the decimal. The numeral with the greatest number of digits before the decimal is the one with the greatest value. The numeral with the fewest number of digits in front of the decimal is the one with the lowest value.

    c. Write the numbers created in *part a* in expanded form.

    Sample response based on part b:

    $$83029.7 = 8 \times 10000 + 3 \times 1000 + 2 \times 10 + 9 \times 1 + 7 \times \left(\frac{1}{10}\right)$$

    $$2831.45 = 2 \times 1000 + 8 \times 100 + 3 \times 10 + 1 \times 1 + 4 \times \left(\frac{1}{10}\right) + 5 \times \left(\frac{1}{100}\right)$$

    $$512.430 = 5 \times 100 + 1 \times 10 + 2 \times 1 + 4 \times \left(\frac{1}{10}\right) + 3 \times \left(\frac{1}{100}\right)$$

2. When the groups finished, they swapped lists of numbers. Lottie's group received the following list of numbers ordered from greatest to least with an explanation.

> 756.208
> 6981.92
> 46231.5
>
> We put these in order using the first digit because all of our numbers have six digits.

a. Explain why the group's reasoning in the box above is incorrect.

The group did not use the decimal placement to determine the value of each digit.

b. Write the numbers from the list Lottie's group received in the correct order. Explain how you know that you are correct.

46231.5
6981.92
756.208

I looked at the number of digits in front of the decimal. The number with the greatest number of digits is the number with the greatest value because they all have different numbers of digits in front of the decimal. If the numbers had the same number of digits in front of the decimal, I would start comparing with the largest place value.

c. Using >, =, or <, compare the number with the greatest value from problem 2c to the number with the greatest value from problem 1b.

Sample response based on part 1b.

$46231.5 < 83029.7$

d. Write your inequality from problem 2d using the number names and words instead of numerals and symbols.

Sample response based on part 2d:

Forty-six thousand two hundred thirty-one and five tenths is less than eighty-three thousand twenty-nine and seven tenths.

e. Write the three numbers from the list Lottie's group received as amounts of money. Explain why the numbers had to change and what you did to change them.

6981.92 $6,981.92

I did not have to change the number because it already had two places after the decimal.

46231.5 $46,231.50

I had to add a zero to have two places behind the decimal.

756.208 $756.21

I had to round the number to the hundredths place in order to have two places after the decimal.

Dixieland Ranch (IT)

Overview

Students will apply their understanding of multiplication and division to determine the supplies needed to construct a fence for a pasture.

Standards

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Convert like measurement units within a given measurement system.

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multistep, real-world problems.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NBT.B.5	• 4.NBT.A.2 • 4.NBT.B.5 • 5.NBT.A.1	1. Multiply 635 x 12. a. 7,620 2. Multiply 1732 x 33. a. 57,156	• http://www.illustrativemathematics.org/illustrations/1562 • http://www.illustrativemathematics.org/illustrations/1800 • http://www.illustrativemathematics.org/illustrations/1799 • http://www.illustrativemathematics.org/illustrations/459 • http://learnzillion.com/lessonsets/789-use-the-standard-algorithm-for-multiplication-of-multidigit-numbers • http://learnzillion.com/lessonsets/257-multiply-multidigit-whole-numbers-using-the-standard-algorithm
5.NBT.B.6	• 5.NBT.B.5	1. Divide 7750 ÷ 31.	• http://learnzillion.com/lessonsets/211-find-

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
		a. 250 2. Divide 9548 ÷ 28. a. 341	whole-number-quotients-with-up-to-4digit-dividends-and-2digit-divisors
5.MD.A.1	• 4.MD.A.1 • 4.MD.A.2	1. Convert 930 yards to feet. a. 2,790 feet 2. http://www.illustrativemathematics.org/illustrations/878	• http://www.illustrativemathematics.org/illustrations/1508 • http://www.illustrativemathematics.org/illustrations/873 • http://learnzillion.com/lessonsets/697-convert-measurement-units-and-solve-real-world-problems • http://learnzillion.com/lessonsets/548-convert-among-differentsized-measurement-units-and-use-these-conversions-to-solve-realworld-problems

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

- **What is a ranch?** A ranch is a large farm where livestock, such as cattle, horses, and pigs, is bred and raised. Ranches typically have lots of open area, which needs to be fenced in to keep the animals safe and on the ranch.
- **What is a pasture?** A pasture is a large area of land covered in grass and other low plants for grazing animals, such as cattle, to be able to roam and eat.

During the Task:

1. Have students work together in groups of two or three for this task.
2. Students may have difficulty deciding how to begin. Have students begin by making a plan including a list of the decisions they will have to make, what they already know, and the information they will need to determine before making those decisions. The given website information is arranged with the information about the gates first, but that does not have to be where students begin their decision-making process.
3. As students work to determine how much barbed wire is needed, monitor the groups to observe the approaches they use. Students may find the total perimeter, multiply it by three (for the three rows of barbed wire), and then try to divide by the feet per roll or feet per coil. Students may encounter difficulty dividing a five-digit dividend by a four-digit divisor. Ask probing questions to help students see that they can find the information for one side of the square pasture and use that information to find the quantity needed for the entire pasture.
4. Some students may forget that three rows of barbed wire are needed to construct the fence. Remind students to go back to the problem setup to find all information needed to solve the problem.
5. Have students share their recommendations with other groups. Encourage groups to ask questions about the process other groups use in order to understand reasoning that may be different from their own.

After the Task:

Discuss how constructing the fence around the pasture is similar to putting a board around a room or a fence around a house or the school. Have students find the cost to put a border around the classroom. Allow students to find costs by researching different options on the Internet. Students will have to measure the classroom in order to determine how much would need to be purchased.

Student Instructional Task

The owners of Dixieland Ranch have hired your group to help determine the materials needed to fence in the pasture and the total cost. Your group will make its decision based on the information given below and any necessary calculations.

- The ranch has an unfenced square pasture that measures 880 yards on each side.
- In order to drive the tractor into the pasture to complete the chores, the pasture needs two wide gates installed on opposite ends of the pasture. The gates come in two different widths: a 10-ft gate and a 12-ft gate. Both gates at opposite ends of the pasture must be the same width.
- Fence posts will need to be purchased to construct the fence. The fence posts must be spaced evenly around the pasture. The distance between each fence post must be the same as the width of the chosen gate. For example, if you choose to purchase the 10-ft gate, the distance between each fence post will need to be 10 feet.
- Three rows of barbed wire will be used to construct the fence around the pasture.
- The owners of the ranch do not wish to spend more than $16,500.

Given the website information below and the details above, create a recommendation for the owners of Dixieland Ranch including which materials should be ordered, the quantity to be ordered, and the total cost of building the fence. Use the order form on the next page to record your recommendations. In addition to completing the order form, support your recommendation with an explanation of why you chose each of the materials and how you determined the quantity needed. Also include a record of your calculations to support the totals on the order form.

Rancher's Website
Fall Sale Page

	Item and Description	**Cost**
Gates	10-ft Center Open Gate (two fence posts needed for installation—not included)	$186 per gate
	12-ft Center Open Gate (two fence posts needed for installation—not included)	$200 per gate
Barbed Wire	1,320-ft roll—12-gauge wire with 4-pt barbs	$75 per roll
	50-ft coils—12-gauge wire with 4-pt barbs	$3 per coil
Fence Posts	Treated Wooden Posts—meant for long-term use Sold in bundles of 10 only	$130 per bundle of 10
	Untreated Wooden Posts—meant for short-term use Sold in bundles of 10 only	$110 per bundle of 10

Rancher's Website Order Form				
Item	**Type**	**Price** (Cost per Item)	**Quantity** (How many needed)	**Total Cost**
Gate				
Barbed Wire				
Fence Post				
TOTAL ORDER AMOUNT				

Instructional Task Exemplar Response

The owners of Dixieland Ranch have hired your group to help determine the materials needed to fence in the pasture and the total cost. Your group will make its decision based on the information given below and any necessary calculations.

- The ranch has an unfenced square pasture that measures 880 yards on each side.
- In order to drive the tractor into the pasture to complete the chores, the pasture needs two wide gates installed on opposite ends of the pasture. The gates come in two different widths: a 10-ft gate and a 12-ft gate. Both gates at opposite ends of the pasture must be the same width.
- Fence posts will need to be purchased to construct the fence. The fence posts must be spaced evenly around the pasture. The distance between each fence post must be the same as the width of the chosen gate. For example, if you choose to purchase the 10-ft gate, the distance between each fence post will need to be 10 feet.
- Three rows of barbed wire will be used to construct the fence around the pasture.
- The owners of the ranch do not wish to spend more than $16,500.

Given the website information below and the details above, create a recommendation for the owners of Dixieland Ranch including which materials should be ordered, the quantity to be ordered, and the total cost of building the fence. Use the order form on the next page to record your recommendations. In addition to completing the order form, support your recommendation with an explanation of why you chose each of the materials and how you determined the quantity needed. Also include a record of your calculations to support the totals on the order form.

Rancher's Website
Fall Sale Page

	Item and Description	**Cost**
Gates	10-ft Center Open Gate (two fence posts needed for installation—not included)	$186 per gate
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Fence Posts	Treated Wooden Posts—meant for long-term use Sold in bundles of 10 only	$130 per bundle of 10
	Untreated Wooden Posts—meant for short-term use Sold in bundles of 10 only	$110 per bundle of 10

There will be multiple solutions to this task as students may have different reasons for choosing certain materials. If possible, allow students to do some research about the items described so they can better understand why some items

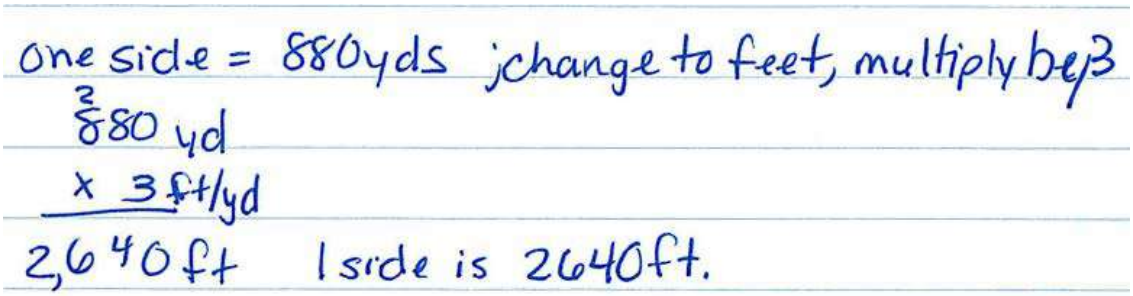
might be chosen over others. Below is one sample order form with a sample written recommendation including calculations to support the order form.

Sample response:

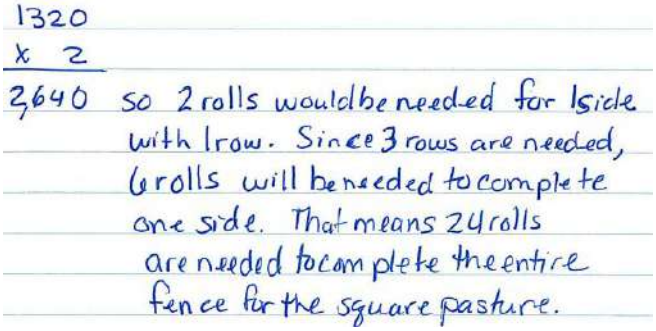
Rancher's Website Order Form				
Item	**Type**	**Price** (Cost per Item)	**Quantity** (How many needed)	**Total Cost**
Gate	*12-ft gate*	*$200*	*2 gates*	*$400*
Barbed Wire	*1,320-ft roll*	*$75*	*24 rolls*	*$1,800*
Fence Post	*Treated Wooden Posts*	*$130*	*88 bundles*	*$11,440*
TOTAL ORDER AMOUNT				*$13,640*

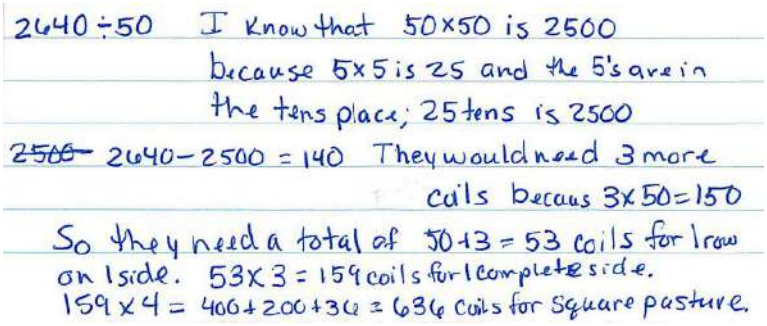
Sample recommendation and calculations:

We started by figuring out the amount of barbed wire we would need. We had to convert 880 yards to feet in order to begin because the barbed wire and gates were sold in feet rather than yards.

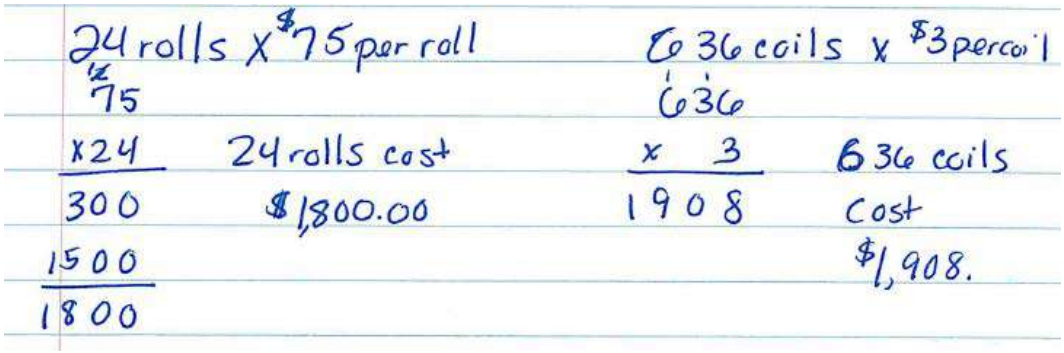


Knowing that the pasture is a square, we then decided to find the amount of barbed wire needed to complete one side of the pasture. Then we would multiply that amount by 4 to find what was needed for the entire pasture.



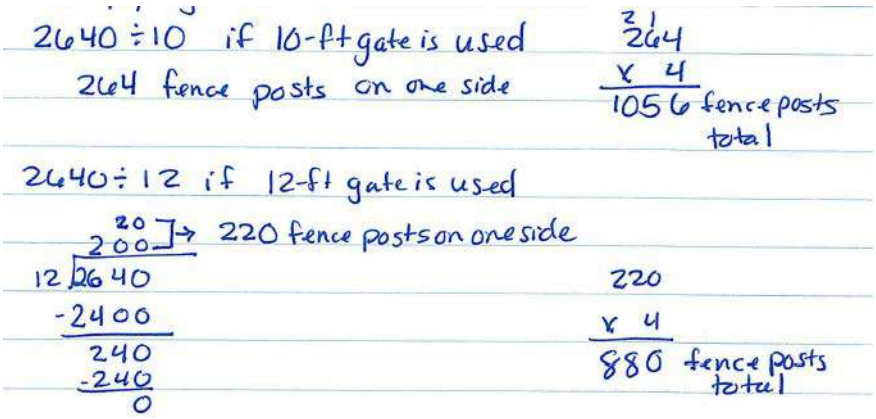


Based on our calculations of how many rolls or coils would be needed, we then found the cost for each option.



Since the cost of buying the 24 rolls is cheaper, we recommend buying the 24 rolls of barbed wire.

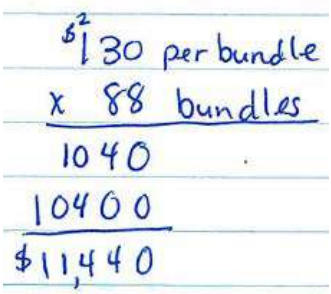
Next we determined the number of fence posts needed. Again, we know that one side of the pasture is 2,640 feet, so if we find the number of fence posts needed for one side we can multiply that by 4 to find the total number needed.



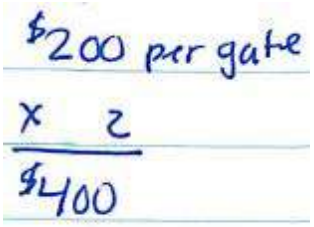
Next, since fence posts are sold only in bundles of 10, we noticed that 880 is divisible by 10 so there would be no fence posts left over. 880 fence posts ÷ 10 posts per bundle = 88 bundles of fence posts. Therefore we recommend spacing the fence posts 12-ft apart, which means we will also recommend the 12-ft gates.

We also recommend the treated fence posts because they are designed to last a longer time—this means they may not have to be changed as often as the untreated fence posts might need to be changed.

Cost for 88 bundles of treated fence posts:



Cost for two 12-ft gates:



Adding up all of the costs, $400 + $1,800 + $11,440 = $13,640, which is under the $16,500 limit.

Rainfall Amounts (IT)

Overview

Students will use rainfall amounts to answer questions that require adding and subtracting fractions with unlike denominators.

Standards

Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 5/12 = 23/12 (in general, a/b +c/d = (ad + bc)/bd).*

5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + ½ = 3/7, by observing that 3/7 < 1/2.*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.A.1	• 4.NF.A.1 • 4.NF.B.3	1. Add $\frac{1}{2} + 1\frac{3}{4}$. a. $\frac{9}{4}$ OR $2\frac{1}{4}$ 2. Subtract $\frac{7}{8} - \frac{1}{4}$. a. $\frac{5}{8}$ 3. http://www.illustrativemathematics.org/illustrations/839 4. http://www.illustrativemathematics.org/illustrations/847	• http://www.illustrativemathematics.org/illustrations/743 • http://www.illustrativemathematics.org/illustrations/881 • http://www.illustrativemathematics.org/illustrations/831 • http://www.illustrativemathematics.org/illustrations/837 • http://www.illustrativemathematics.org/illustrations/968 • http://www.illustrativemathematics.org/illustrations/856 • http://www.illustrativemathematics.org/illustrations/874 • http://learnzillion.com/lessonsets/536-add-and-subtract-fractions-and-mixed-numbers-with-unlike-denominators-using-fraction-bars • http://learnzillion.com/lessonsets/383-add-and-subtract-fractions-and-mixed-numbers-

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
			with-unlike-denominators-using-area-models • http://learnzillion.com/lessonsets/216-add-and-subtract-fractions-with-unlike-denominators • http://learnzillion.com/lessonsets/63-add-and-subtract-mixed-numbers
5.NF.A.2	• 4.NF.A.2	1. If you have $\frac{3}{4}$ cup water and $\frac{2}{3}$ cup water, how many total cups of water do you have? a. $1\frac{5}{12}$ cups 2. http://www.illustrativemathematics.org/illustrations/481	• http://www.illustrativemathematics.org/illustrations/812 • http://www.illustrativemathematics.org/illustrations/811 • http://www.illustrativemathematics.org/illustrations/183 • http://learnzillion.com/lessonsets/642-assess-the-reasonableness-of-answers-to-word-problems-involving-the-addition-and-subtraction-of-fractions • http://learnzillion.com/lessonsets/385-solve-word-problems-involving-the-addition-and-subtraction-of-fractions-with-unlike-denominators • http://learnzillion.com/lessonsets/223-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-2 • http://learnzillion.com/lessonsets/219-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-1

Real-World Preparation: The following tips will prepare students for some of the real-world components of this task:

1. It may be helpful to discuss the different city locations from the task. This could be a social studies connection.

During the Task:

- As students work through the task, they may have difficulty finding common denominators to compare fractions. Remind students of the different ways to compare the fractions. For example, students locate the fractions on a number line and find their distances from 1 (or the next whole number if both fractions are larger than 1) as another way to compare the fractions.

After the Task:

Students can connect this to their own lives by collecting water in a rain gauge on various days that it rains. This data can be used to compare fractions. With the actual rain to look at, students will have a better understanding of the fractions.

Student Instructional Task

The table below shows the possible rainfall amounts over a 24-hour period in four different cities.

City	Rainfall (in inches)
New Orleans	$1\frac{1}{2}$
Lafayette	$\frac{1}{10}$
Baton Rouge	$\frac{7}{8}$
Shreveport	$2\frac{3}{4}$

1. Choose two cities from the table above and complete the questions that follow.

   a. City One: _____ City Two: _____

   b. Look at the rainfall amounts for the two cities you chose. Which one had more rainfall during the 24-hour period? What is the difference between the two rainfall amounts? Show how you found the difference.

2. Look at the rainfall amounts for the two cities you did not choose**.** Which of these two cities received less rain during the 24-hour period? What is the difference between the two rainfall amounts? Show how you found the difference.

3. What was the total rainfall for all four cities during the 24-hour period? Show your work.

4. Complete the table above by adding information for the city of Alexandria. Alexandria had a rainfall amount that was more than Lafayette but less than Baton Rouge. Show or explain how you determined a possible rainfall amount for Alexandria.

Instructional Task Exemplar Response

The table below shows the possible rainfall amounts over a 24-hour period in four different cities.

City	Rainfall in inches
New Orleans	$1\frac{1}{2}$
Lafayette	$\frac{1}{10}$
Baton Rouge	$\frac{7}{8}$
Shreveport	$2\frac{3}{4}$
Alexandria	$\mathbf{\frac{1}{2}}$ ***(Sample response)***

1. Choose two cities from the table above and complete the questions that follow.

   a. City One: _____*New Orleans*_____ City Two: _____*Lafayette*_____

   b. Look at the rainfall amounts for the two cities you chose. Which one had more rainfall during the 24-hour period? What is the difference between the two rainfall amounts? Show how you found the difference.

   Sample answer based on cities chosen in part a:

   New Orleans had more rainfall during the 24-hour period. New Orleans received $1\frac{2}{5}$ *inch rainfall more than Lafayette.*

   $1\frac{1}{2} = \frac{3}{2} = \frac{15}{10}$

   $\frac{15}{10} - \frac{1}{10} = \frac{14}{10} = 1\frac{4}{10}$ or $1\frac{2}{5}$

2. Look at the rainfall amounts for the two cities you did not choose**.** Which of these two cities received less rain during the 24-hour period? What is the difference between the two rainfall amounts? Show how you found the difference.

   Sample answer based on the cities not chosen for question 1:

   Baton Rouge had less rain during the 24-hour period. Baton Rouge received $1\frac{7}{8}$ *inches rainfall less than Shreveport.*

$2\frac{3}{4} - \frac{7}{8} = \frac{11}{4} - \frac{7}{8} = \frac{22}{8} - \frac{7}{8} = \frac{15}{8} = 1\frac{7}{8}$

3. What was the total rainfall for all four cities during the 24-hour period? Show your work.

$$1\frac{1}{2} = \frac{3}{2} = \frac{60}{40}$$

$$\frac{1}{10} = \frac{4}{40}$$

$$\frac{7}{8} = \frac{35}{40}$$

$$2\frac{3}{4} = \frac{11}{4} = \frac{110}{40}$$

$\frac{60}{40} + \frac{4}{40} + \frac{35}{40} + \frac{110}{40} = \frac{209}{40} = 5\frac{9}{40}$

$5\frac{9}{40}$ *inches fell in the four cities during the 24-hour period.*

***Note: Students may choose to use other methods to add these four fractions.*

4. Complete the table above by adding information for the city of Alexandria. Alexandria had a rainfall amount that was more than Lafayette but less than Baton Rouge. Show or explain how you determined a possible rainfall amount for Alexandria.

A sample response is given in the table. The answer must be a fraction between $\frac{1}{10}$ *and* $\frac{7}{8}$.

I got $\frac{1}{2}$ *by finding a common denominator for both fractions. The common denominator is 40.* $\frac{1}{10} = \frac{4}{40}$ *and* $\frac{7}{8} = \frac{35}{40}$. *Since one fraction is smaller than one-half and one is greater than one-half, I decided to choose* $\frac{1}{2}$ *which is* $\frac{20}{40}$.

Colored Jugs (IT)

Overview

Students will use knowledge of fractions to answer questions related to fractions of a gallon.

Standards

Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + ½ = 3/7, by observing that 3/7 < 1/2.*

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

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

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

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

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

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

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
5.NF.A.2	• 4.NF.A.2 • 5.NF.A.1	1. New Orleans, Louisiana, received $\frac{2}{3}$ inch of rain on Monday and $\frac{5}{6}$ inch of rain on Tuesday. How much total rain did the city receive for both days? a. $\frac{9}{6}$ inches or $1\frac{1}{2}$ inches 2. http://www.illustrativemathematics.org/illustrations/481	• http://www.illustrativemathematics.org/illustrations/812 • http://www.illustrativemathematics.org/illustrations/811 • http://www.illustrativemathematics.org/illustrations/183 • http://learnzillion.com/lessonsets/642-assess-the-reasonableness-of-answers-to-word-problems-involving-the-addition-and-subtraction-of-fractions • http://learnzillion.com/lessonsets/385-solve-word-problems-involving-the-addition-and-subtraction-of-fractions-with-unlike-denominators • http://learnzillion.com/lessonsets/223-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-2 • http://learnzillion.com/lessonsets/219-solve-word-problems-involving-addition-and-subtraction-of-fractions-referring-to-the-same-whole-1
5.NF.B.4a	• 3.MD.C.7b • 4.NF.B.4	1. Ming is making bows for gifts. She uses $\frac{2}{3}$ yard of ribbon for each bow. If she is making 4 bows, how much ribbon will she need? a. $\frac{8}{3}$ yards or $1\frac{2}{3}$ yards 2. http://www.illustrativemathematics.org/illustrations/321	• http://www.illustrativemathematics.org/illustrations/857 • http://learnzillion.com/lessonsets/316-interpret-the-product-ab-x-q-as-a-part-of-a-partition-of-q-into-b-equal-parts • http://learnzillion.com/lessonsets/66-multiply-fractions
5.NF.B.6	• 3.OA.A.1 • 3.OA.A.2 • 4.OA.A.1 • 4.OA.A.2 • 4.MD.A.2	1. $\frac{3}{5}$ of the audience for a play was female. Of the females, $\frac{6}{7}$ were under the age of 15. What fraction of the audience were females under the age of 15? a. $\frac{18}{35}$ 2. http://www.illustrativemathematics.org/illustrations/295 3. http://www.illustrativemathematics.org/illustrations/294	• http://www.illustrativemathematics.org/illustrations/1531 • http://www.illustrativemathematics.org/illustrations/1540 • http://www.illustrativemathematics.org/illustrations/263 • http://www.illustrativemathematics.org/illustrations/873 • http://learnzillion.com/lessonsets/538-solve-problems-involving-multiplication-of-fractions-and-mixed-numbers • http://learnzillion.com/lessonsets/67-multiply-fractions-and-mixed-numbers
5.NF.B.7c	• 3.OA.B.6 • 3.NF.A.1	1. A grandmother left $\frac{1}{5}$ of her	• http://www.illustrativemathematics.org/illustrations/833

Grade Level Standard	The Following Standards Will Prepare Them	Items to Check for Task Readiness	Sample Remediation Items
	• 4.NF.B.4	savings to each of her 6 grandchildren. What fraction of the savings did each grandchild receive? a. $\frac{1}{30}$ 2. http://www.illustrativemathematics.org/illustrations/1120	• http://learnzillion.com/lessonsets/737-divide-whole-numbers-by-unit-fractions-and-unit-fractions-by-whole-numbers

During the Task:

- Encourage students to share their answers and reasoning (with each other) to questions 1 and 2. Students should be guided to offer suggestions to each other about different ways to approach the problem. Share different approaches with the whole class and allow students to critique each other's reasoning.
- Encourage students to use visual fraction models to help answer the questions. Students can either use manipulatives or drawings for the visual models. Have students draw representations of the models to support their explanations.
- Guide students to create a table to keep track of the fraction of a gallon each jug holds for Demetrius and Brooke. This will help students stay organized as they work through the task.
- Students may have difficulty determining an amount of lemonade for Brooke in the final question. It may not be apparent at first that if she simply has more than Demetrius, her friend will receive a larger amount. Ask students to find a fraction that one of Brooke's friends could receive that would be greater than the fraction Demetrius's friends received. Then have students find the amount Brooke's jug would hold if all 6 of her friends received that same amount.

After the Task:

To connect this to the real world, students could be placed in groups and make lemonade in various containers. They could divide it equally among their group members. They could measure the amount each group member has. This could lead to a discussion about future jobs in the restaurant industry where they may need to determine servings in a container.

Student Instructional Task

Demetrius and Brooke each have 5 colored jugs. They have one of each of the following colors: red, blue, yellow, green, and orange. Each of their jugs hold less than one gallon.

1. Demetrius has a red jug that is measured in sevenths of a gallon. Brooke's red jug is measured in ninths of a gallon.
    a. Give an example of what fraction of a gallon each of their jugs could hold if Brooke's red jug holds more than Demetrius's red jug. Explain your thinking.

    b. Based on your example, how much more of a gallon does Brooke's red jug hold than Demetrius's red jug? Show your work.

2. Demetrius's blue jug is measured in fourths of a gallon, and Brooke's blue jug is measured in sixteenths of a gallon.
    a. Give an example that would show their blue jugs hold the same amount. Explain your thinking.

    b. Based on your example, what is the total amount that both blue jugs would hold?

3. Brooke's yellow jug holds $\frac{3}{4}$ of a gallon. If she fills the jug four times with water and pours the water into a bucket, how much water will be in the bucket? Show how you found your answer.

4. Give an example that would show that Brooke has a green jug that holds four times more water than the green jug Demetrius has. Remember that all jugs hold less than one gallon. Explain your thinking.

5. Demetrius fills his orange jug with lemonade to share with his friends. If his jug contains $\frac{1}{2}$ of a gallon, what fraction of a gallon would each of his 6 friends receive? (Do not include Demetrius.) Show your work.

6. Brooke thinks sharing lemonade is a great idea and decides to do the same. How much lemonade could her orange jug hold in order to give her 6 friends a larger amount than Demetrius's friends received? (Remember her orange jug holds less than one gallon.) Show your work.

Instructional Task Exemplar Response

Demetrius and Brooke each have 5 colored jugs. They have one of each of the following colors: red, blue, yellow, green, and orange. Each of their jugs hold less than one gallon.

1. Demetrius has a red jug that is measured in sevenths of a gallon. Brooke's red jug is measured in ninths of a gallon.
    a. Give an example of what fraction of a gallon each of their jugs could hold if Brooke's red jug holds more than Demetrius's red jug. Explain your thinking.

    Sample answer:

    Brooke's jug could hold $\frac{7}{9}$ *and Demetrius's jug could hold* $\frac{4}{7}$*. I can change the fractions into equivalent fractions with common denominators.* $\frac{49}{63}$*(Brooke's) >* $\frac{36}{63}$ *(Demetrius's).*

    b. Based on your example, how much more of a gallon does Brooke's red jug hold than Demetrius's red jug? Show your work.

    Sample answer based on part a:

    $\frac{49}{63} - \frac{36}{63} = \frac{13}{63}$ *Brooke's red jug holds* $\frac{13}{63}$ *of a gallon more than Demetrius's red jug.*

2. Demetrius's blue jug is measured in fourths of a gallon, and Brooke's blue jug is measured in sixteenths of a gallon.
    a. Give an example that would show their blue jugs hold the same amount. Explain your thinking.

    Sample answer:

    Demetrius's jug holds $\frac{3}{4}$ *and Brooke's holds* $\frac{12}{16}$*.* $\frac{3}{4}$ *is equivalent to* $\frac{12}{16}$ *because it takes four groups of four to make 16 for the denominator. Four groups of three in the numerator would make 12.*

    b. Based on your example, what is the total amount that both blue jugs would hold?

    Sample answer based on part a:

    $\frac{3}{4} \times 2 = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$ *Together the two blue jugs hold* $1\frac{1}{2}$ *gallons.*

    ***Note: Students may also show addition here.*

3. Brooke's yellow jug holds $\frac{3}{4}$ of a gallon. If she fills the jug four times with water and pours the water into a bucket, how much water will be in the bucket? Show how you found your answer.

    $\frac{3}{4}$ *x 4 =* $\frac{12}{4} = 3$ *There will be 3 gallons of water in the bucket.*

4. Give an example that would show that Brooke has a green jug that holds four times more water than the green jug Demetrius has. Remember that all jugs hold less than one gallon. Explain your thinking.

   Sample answer:

   Demetrius has a jug that holds $\frac{1}{6}$ of a gallon. Brooke has a jug that holds $\frac{4}{6}$ of a gallon.

   I know that $\frac{1}{6} \times 4 = \frac{4}{6}$, so Brooke's green jug holds four times more than Demetrius's green jug.

5. Demetrius fills his orange jug with lemonade to share with his friends. If his jug contains $\frac{1}{2}$ of a gallon, what fraction of a gallon would each of his 6 friends receive? (Do not include Demetrius.) Show your work.

   $\frac{1}{2} \div 6 = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$ *Each of Demetrius's friends will receive $\frac{1}{12}$ of a gallon of lemonade.*

6. Brooke thinks sharing lemonade is a great idea and decides to do the same. How much lemonade could her orange jug hold in order to give her 6 friends a larger amount than Demetrius's friends received? (Remember her orange jug holds less than one gallon.) Show your work.

   Sample answer:

   Her jug could hold $\frac{6}{7}$ of a gallon of lemonade. Any fraction larger than $\frac{1}{2}$ would work because if Brooke has more than $\frac{1}{2}$ of a gallon and is sharing with the same number of people as Demetrius, then each person would get more than $\frac{1}{12}$ of a gallon of lemonade.

APPENDIX

Understanding Mathematics

These Standards define what students should understand and be able to do in their study of mathematics. Asking a student to understand something means asking a teacher to assess whether the student has understood it. But what does mathematical understanding look like? One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as (a+b)(x+y) and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics, and may have a better chance to succeed at a less familiar task such as expanding (a+b+c)(x+y). Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness.

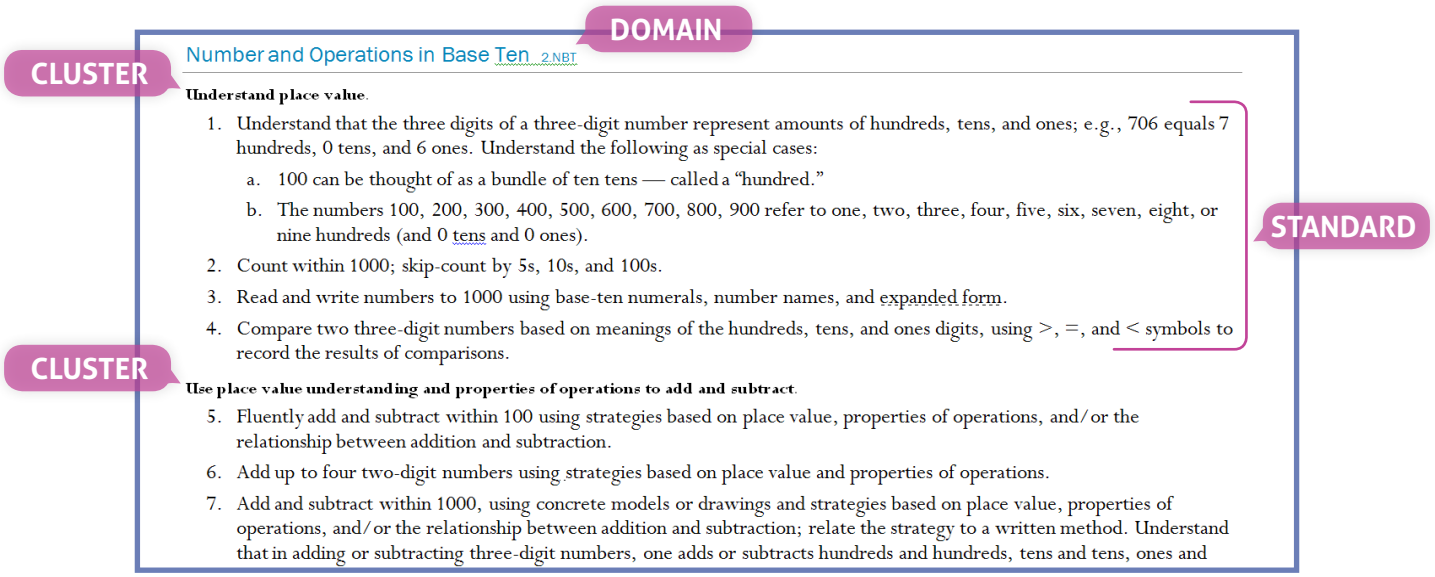
The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives. The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participation of students with special education needs. For example, for students with disabilities reading should allow for use of Braille, screen reader technology, or other assistive devices, while writing should include the use of a scribe, computer, or speech-to-text technology. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.

How to read the grade level standards

Standards define what students should understand and be able to do.

Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.

Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.



These Standards do not dictate curriculum or teaching methods. For example, just because topic A appears before topic B in the standards for a given grade, it does not necessarily mean that topic A must be taught before topic B. A teacher might prefer to teach topic B before topic A, or might choose to highlight connections by teaching topic A and topic B at the same time. Or, a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B.

What students can learn at any particular grade level depends upon what they have learned before. Ideally then, each standard in this document might have been phrased in the form, "Students who already know … should next come to learn …." But at present this approach is unrealistic—not least because existing education research cannot specify all such learning pathways. Of necessity therefore, grade placements for specific topics have been made on the basis of state and international comparisons and the collective experience and collective professional judgment of educators, researchers and mathematicians. One promise of common state standards is that over time they will allow research on learning progressions to inform and improve the design of standards to a much greater extent than is possible today. Learning opportunities will continue to vary across schools and school systems, and educators should make every effort to meet the needs of individual students based on their current understanding.

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep.

Mathematics | Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. **Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. **Reason abstractly and quantitatively.**

Mathematically proficient students make sense of the quantities and their relationships in problem situations. Students bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. **Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. **Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. **Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. **Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. **Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. **Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y–2)/(x–1)=3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

In Grade 3, instructional time should focus on four critical areas:

1) Developing understanding of multiplication and division and strategies for multiplication and division within 100;
2) Developing understanding of fractions, especially unit fractions (fractions with numerator 1);
3) Developing understanding of the structure of rectangular arrays and of area; and
4) Describing and analyzing two-dimensional shapes

(1) Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using in-creasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

(2) Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

(3) Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

(4) Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

LOUISIANA GRADES 3-5 MATHEMATICS STANDARDS

Grade 3 Overview

Math Standards		Math Practices
Operations and Algebraic Thinking	• Represent and solve problems involving multiplication and division. • Understand properties of multiplication and the relationship between multiplication and division. • Multiply and divide within 100. • Solve problems involving the four operations, and identify and explain patterns in arithmetic.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Number and Operations in Base Ten	• Use place value understanding and properties of operations to perform multi-digit arithmetic.	
Number and Operations—Fractions	• Develop understanding of fractions as numbers	
Measurement and Data	• Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. • Represent and interpret data. • Geometric measurement: understand concepts of area and relate area to multiplication and to addition. • Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	
Geometry	• Reason with shapes and their attributes.	

Operations and Algebraic Thinking 3.OA

Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 x 7.*
2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 x 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 x 8.
3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = ? ÷ 3, 6 ÷ 6 = ?.*

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

5. Apply properties of operations as strategies to multiply and divide. *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.)*
6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

Multiply and divide within 100.

7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

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

8. Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using prop-erties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Number and Operations in Base Ten 3.NBT

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

1. Use place value understanding to round whole numbers to the nearest 10 or 100.
2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

Number and Operations—Fractions 3.NF

Develop understanding of fractions as numbers.

1. Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction *a/b* as the quantity formed by a parts of size 1/*b*.

2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.
   a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.
   b. Represent a fraction *a/b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting in-terval has size *a/b* and that its endpoint locates the number *a/b* on the number line.
3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
   a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
   b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.
   c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*
   d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Measurement and Data 3.MD

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

1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Represent and interpret data.

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

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

5. Recognize area as an attribute of plane figures and understand concepts of area measurement.

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 which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.

6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

7. Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.

d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Geometry 3.G

Reason with shapes and their attributes.

1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as ¼ of the area of the shape.*

In Grade 4, instructional time should focus on three critical areas:

1) Developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends;

2) Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers;

3) Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

(1) Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

(2) Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, de-composing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

(3) Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Grade 4 Overview

Math Standards		Math Practices
Operations and Alge-braic Thinking	• Use the four operations with whole numbers to solve problems. • Gain familiarity with factors and multiples. • Generate and analyze patterns.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Number and Operations in Base Ten	• Generalize place value understanding for multi-digit whole numbers. • Use place value understanding and properties of operations to perform multi-digit arithmetic.	
Number and Operations—Fractions	• Extend understanding of fraction equivalence and ordering. • Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. • Understand decimal notation for fractions, and compare decimal fractions.	
Measurement and Data	• Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. • Represent and interpret data. • Geometric measurement: Understand concepts of angle and measure angles.	
Geometry	• Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	

Operations and Algebraic Thinking 4.OA

Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive com-parison.
3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its fac-tors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Generate and analyze patterns.

5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

Number and Operations in Base Ten 4.NBT

Generalize place value understanding for multi-digit whole numbers.

1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.
2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of com-parisons.
3. Use place value understanding to round multi-digit whole numbers to any place.

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

4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Number and Operations—Fractions 4.NF

Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction *a/b* is equivalent to a fraction *(n × a)/(n × b)* by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. 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.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3. Understand a fraction a/b with a > 1 as a sum of fractions 1/*b*.

    a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

    b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each de-composition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: ⅜ = ⅛ + ⅛ + ⅛ ; ⅜ = ⅛ + ⅔ ; 2⅛ = 1 + 1 + ⅛ = ⅞ + ⅞ + ⅛.*

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

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

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

    a. Understand a fraction a/b as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (¼), recording the conclusion by the equation ⅝ = 5 × (¼).*

    b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (⅖) as 6 × (⅕), recognizing this product as ⅘. (In general, n × (a/b) = (n × a)/b.)*

    c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat ⅜ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

Understand decimal notation for fractions, and compare decimal fractions.

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as ³⁰⁄₁₀₀, and add ³⁄₁₀ + ⁴⁄₁₀₀ = ³⁴⁄₁₀₀.*

6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as ⁶²⁄₁₀₀; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

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

Measurement and Data 4.MD

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

1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*
2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
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.*

Represent and interpret data.

4. Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

Geometric measurement: understand concepts of angle and measure angles.

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
   a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through ⅟₃₆₀ of a circle is called a "one-degree angle," and can be used to measure angles.
   b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Geometry 4.G

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

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or ab-sence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

In Grade 5, instructional time should focus on three critical areas:

1) Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions);

2) Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and

3) Developing understanding of volume.

(1) Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

(2) Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

(3) Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

LOUISIANA GRADES 3-5 MATHEMATICS STANDARDS

Grade 5 Overview

Math Standards		Math Practices
Operations and Alge-braic Thinking	• Write and interpret numerical expressions. • Analyze patterns and relationships.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Number and Opera-tions in Base Ten	• Understand the place value system. • Perform operations with multi-digit whole numbers and with decimals to hundredths.	
Number and Opera-tions—Fractions	• Use equivalent fractions as a strategy to add and subtract fractions. • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	
Measurement and Data	• Convert like measurement units within a given measurement system. • Represent and interpret data. • Geometric measurement: Understand concepts of volume and relate volume to multiplication and to addition.	
Geometry	• Graph points on the coordinate plane to solve real world and mathematical problems. • Classify two-dimensional figures into categories based on their properties.	

Operations and Algebraic Thinking 5.OA

Write and interpret numerical expressions.

1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Analyze patterns and relationships.

3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Number and Operations in Base Ten 5.NBT

Understand the place value system.

1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
3. Read, write, and compare decimals to thousandths.
   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
4. Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5. Fluently multiply multi-digit whole numbers using the standard algorithm.
6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Number and Operations—Fractions 5.NF

Use equivalent fractions as a strategy to add and subtract fractions.

1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, ⅔ + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result ⅖ + ½ = 3/7, by observing that 3/7 < ½.*

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

3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret ¾ as the result of dividing 3 by 4, noting that ¾ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size ¾. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

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

    a. Interpret the product (*a/b*) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations *a × q ÷ b. For example, use a visual fraction model to show (⅔) × 4 = 8/3, and create a story context for this equation. Do the same with (⅔) × (⅘) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

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

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

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

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

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

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

    a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (⅓) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (⅓) ÷ 4 = 1/12 because (1/12) × 4 = ⅓.*

b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (⅕) = 20 because 20 × (⅕) = 4.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share ½ lb of chocolate equally? How many ⅓-cup servings are in 2 cups of raisins?*

Measurement and Data 5.MD

Convert like measurement units within a given measurement system.

1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Represent and interpret data.

2. Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

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

3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
   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 which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

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

5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
   a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
   b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
   c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Geometry 5.G

Graph points on the coordinate plane to solve real-world and mathematical problems.

1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of num-bers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and in-terpret coordinate values of points in the context of the situation.

Classify two-dimensional figures into categories based on their properties.

3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that cate-gory. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

4. Classify two-dimensional figures in a hierarchy based on properties.