

COMMON CORE

State Standards

DECONSTRUCTED for
CLASSROOM IMPACT

FOURTH GRADE ARTS
MATHEMATICS



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Introduction

The Common Core Institute is pleased to offer this grade-level tool for educators who are teaching with the Common Core State Standards.

The Common Core Standards Deconstructed for Classroom Impact is designed for educators by educators as a two-pronged resource and tool 1) to help educators increase their depth of understanding of the Common Core Standards and 2) to enable teachers to plan College & Career Ready curriculum and classroom instruction that promotes inquiry and higher levels of cognitive demand.

What we have done is not all new. This work is a purposeful and thoughtful compilation of preexisting materials in the public domain, state department of education websites, and original work by the Center for College & Career Readiness. Among the works that have been compiled and/or referenced are the following: Common Core State Standards for Mathematics and the Appendix from the Common Core State Standards Initiative; Learning Progressions from The University of Arizona’s Institute for Mathematics and Education, chaired by Dr. William McCallum; the Arizona Academic Content Standards; the North Carolina Instructional Support Tools; and numerous math practitioners currently in the classroom.

We hope you will find the concentrated and consolidated resource of value in your own planning. We also hope you will use this resource to facilitate discussion with your colleagues and, perhaps, as a lever to help assess targeted professional learning opportunities.

Understanding the Organization

The **Overview** acts as a quick-reference table of contents as it shows you each of the domains and related clusters covered in this specific grade-level booklet. This can help serve as a reminder of what clusters are part of which domains and can reinforce the specific domains for each grade level.

Key Changes identifies what has been moved to and what has been moved from this particular grade level, as appropriate. This section also includes **Critical Areas of Focus**, which is designed to help you begin to approach how to examine your curriculum, resources, and instructional practices. A review of the **Critical Areas of Focus** might enable you to target specific areas of professional learning to refresh, as needed.

For each domain is the domain itself and the associated clusters. Within each domain are sections for each of the associated clusters. The cluster-specific content can take you to a deeper level of understanding. Perhaps most importantly, we include here the **Learning Progressions**. The **Learning Progressions** provide context for the current domain and its related standards. For any grade except Kindergarten, you will see the domain-specific standards for the current

Math Fluency Standards	
K	Add/subtract within 5
1	Add/subtract within 10
2	Add/subtract within 20 Add/subtract within 100 (pencil & paper)
3	Multiply/divide within 100 Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2×2 systems by inspection

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LEXILE GRADE LEVEL BAND: 740L TO 940L

grade in the center column. To the left are the domain-specific standards for the preceding grade and to the right are the domain-specific standards for the following grade. Combined with the **Critical Areas of Focus**, these **Learning Progressions** can assist you in focusing your planning.

For each cluster, we have included four key sections: Description, Big Idea, Academic Vocabulary, and Deconstructed Standard.

The cluster **Description** offers clarifying information, but also points to the **Big Idea** that can help you focus on that which is most important for this cluster within this domain. The **Academic Vocabulary** is derived from the cluster description and serves to remind you of potential challenges or barriers for your students.

Each standard specific to that cluster has been deconstructed. There **Deconstructed Standard** for each standard specific to that cluster and each **Deconstructed Standard** has its own subsections, which can provide you with additional guidance and insight as you plan. Note the deconstruction drills down to the sub-standards when appropriate. These subsections are:

- Standard Statement
- Standard Description
- Essential Question(s)
- Mathematical Practice(s)
- DOK Range Target for Learning and Assessment
- Learning Expectations
- Explanations and Examples

As noted, first are the **Standard Statement** and **Standard Description**, which are followed by the **Essential Question(s)** and the associated **Mathematical Practices**. The **Essential Question(s)** amplify the **Big Idea**, with the intent of taking you to a deeper level of understanding; they may also provide additional context for the **Academic Vocabulary**.

The **DOK Range Target for Learning and Assessment** remind you of the targeted level of cognitive demand. The **Learning Expectations** correlate to the DOK and express the student learning targets for student proficiency for KNOW, THINK, and DO, as appropriate. In some instances, there may be no learning targets for student proficiency for one or more of KNOW, THINK or DO. The learning targets are expressions of the deconstruction of the Standard as well as the alignment of the DOK with appropriate consideration of the Essential Questions.

The last subsection of the **Deconstructed Standard** includes **Explanations and Examples**. This subsection might be quite lengthy as it can include additional context for the standard itself as well as examples of what student work and student learning could look like. **Explanations and Examples** may offers ideas for instructional practice and lesson plans.

Standards for Mathematical Practice in 4th Grade

Each of the explanations below articulates some of the knowledge and skills expected of students to demonstrate grade-level mathematical proficiency.

PRACTICE	EXPLANATION
<p>Make sense and persevere in problem solving.</p>	<p>Students can explain the meaning of a problem and look for ways to solve it. They may still use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, “Does this make sense?” They may use another method or strategy to check their thinking and their answers. Students listen to the strategies of others and are willing to try different approaches.</p>
<p>Reason abstractly and quantitatively.</p>	<p>Students recognize that a number represents a specific quantity. They can connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. Students can extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions, record calculations with numbers, and represent or round numbers using place value concepts.</p>
<p>Construct viable arguments and critique the reasoning of others.</p>	<p>Students may construct arguments using concrete referents, such as objects or graphical representations. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in discussions involving questions like “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to others’ thinking.</p>
<p>Model with mathematics.</p>	<p>Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), and graphical representations.</p>
<p>Use appropriate tools strategically.</p>	<p>Students consider the available tools (including estimation) when solving a problem and decide when certain tools might be helpful.</p>
<p>Attend to precision.</p>	<p>Students develop their mathematical communication skills; they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose.</p>
<p>Look for and make use of structure.</p>	<p>Students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They generate number or shape patterns that follow a given rule.</p>
<p>Look for and express regularity in repeated reasoning.</p>	<p>Students should notice repetitive actions in computation to make generalizations. Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms.</p>

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 190L TO 530L

OVERVIEW

Operations and Algebraic Thinking

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten

- Generalize place value understanding for multidigit 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.

KEY CHANGES

NEW TO FOURTH GRADE

- Factors and multiples (4.OA.4)
- Multiply a fraction by a whole number (4.NF.4)
- Conversions of measurements within the same system (4.MD.1, 4.MD.2)
- Angles and angle measurements (4.MD.5, 4.MD.6, 4.MD.7)
- Lines of symmetry (4.G.3)

MOVED FROM FOURTH GRADE

- Coordinate system (3.01)
- Transformations (3.03)
- Line graphs and bar graphs (4.01)
- Data - median, range, mode, comparing sets data (4.03)
- Probability (4.04)
- Number relationships (5.02, 5.03)

KEY CHANGES

CRITICAL AREAS OF FOCUS

1. Developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends.

- 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. Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators and multiplication of fractions by whole numbers

- 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, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

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.

- 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.

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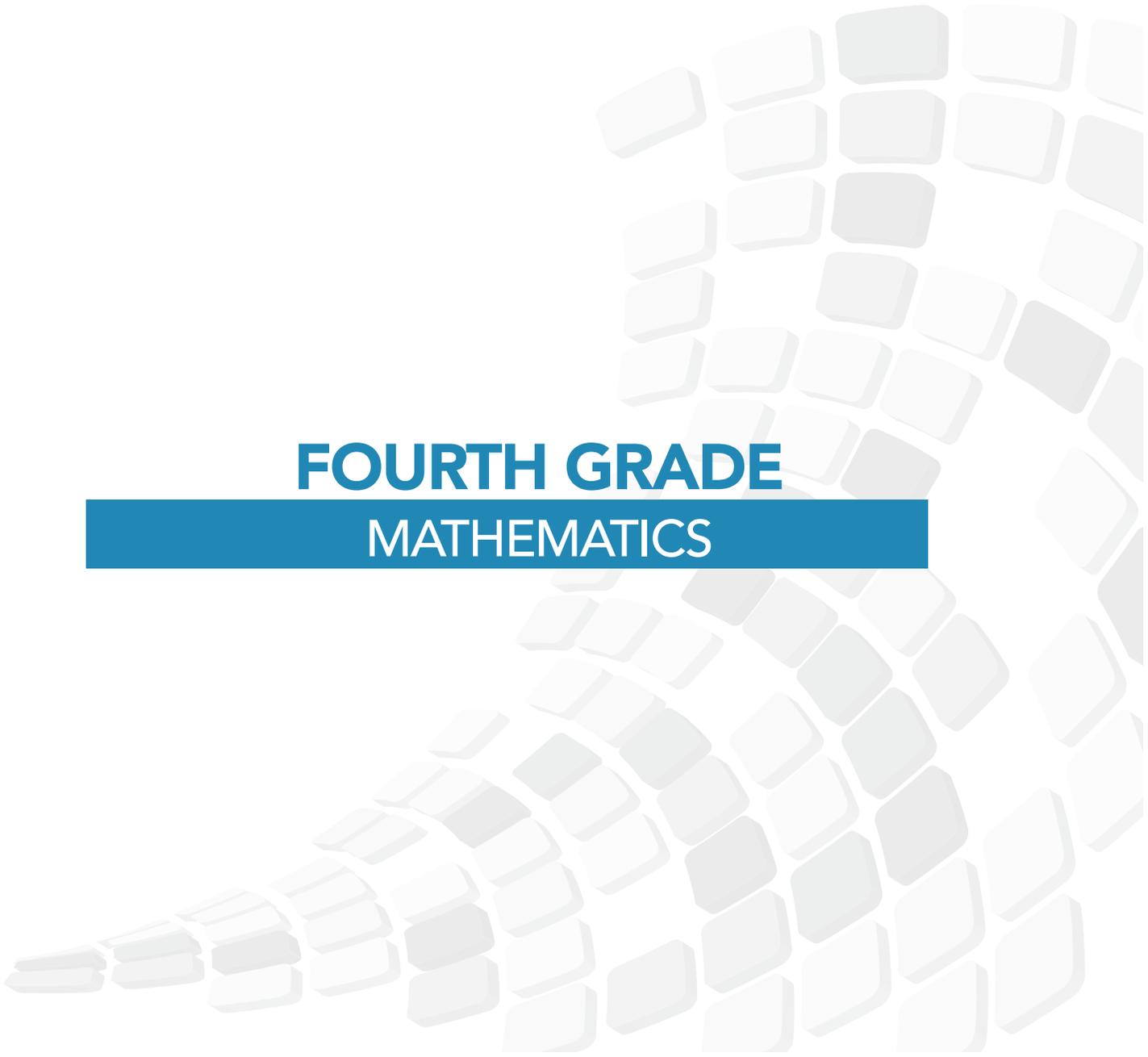
LEXILE GRADE LEVEL BAND: 740L TO 940L

DOMAIN:

**OPERATIONS &
ALGEBRAIC THINKING
(OA)**

FOURTH GRADE

MATHEMATICS



DOMAIN

Operations and Algebraic Thinking

CLUSTERS

1. Use the four operations with whole numbers to solve problems.
2. Gain familiarity with factors and multiples.
3. Generate and analyze patterns.

OPERATIONS AND ALGEBRAIC THINKING (OA)

THIRD	FOURTH	FIFTH
Early Equations and Expressions		
Section 1: Exploring arithmetic and geometric patterns/sequences	Section 1: Exploring arithmetic and geometric patterns/sequences	Section 1: Exploring arithmetic and geometric patterns/sequences
OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.	4.OA.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.	5.OA.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.
Exploring Equations	Exploring Equations	Exploring Equations
3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.		
3.OA.8 Solve two-step word problems using the four operations (restricted to whole numbers) and apply rules for order of 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.		
Working with Expressions	Working with Expressions	Working with Expressions
		OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
		OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
Multiplication and Division		
Section 1: Understanding and Relating Multiplication and Division Operations	Section 1: Understanding and Relating Multiplication and Division Operations	Section 1: Understanding and Relating Multiplication and Division Operations
3.OA.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.	4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ 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.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ 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.	4.OA.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.	

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OPERATIONS AND ALGEBRAIC THINKING (OA)

THIRD	FOURTH	FIFTH
3.OA.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.6 Understand division as an unknown-factor problem.		
Multiplication and Division Properties and Facts	Multiplication and Division Properties and Facts	Multiplication and Division Properties and Facts
3.OA.5 Apply properties of operations as strategies to multiply and divide. Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$ (Distributive property.)		
3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.		

Source: turnonccmath.net, NC State University College of Education

MATHEMATICS

CLUSTER:	1. Use the four operations with whole numbers to solve problems.
BIG IDEA:	Word Problems are solved using equations and the four operations
ACADEMIC VOCABULARY:	multiplication/multiply, division/divide, addition/add, subtraction/subtract, equations, unknown, remainders, reasonableness, mental computation, estimation, rounding

STANDARD AND DECONSTRUCTION

4.OA.1	Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ 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.		
DESCRIPTION	<p>This standard interprets products of whole numbers.</p> <p><i>A multiplicative comparison</i> is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., “a is n times as much as b”). Students should be able to identify and verbalize which quantity is being multiplied and which number tells how many times.</p> <p>Students should be given opportunities to write and identify equations and statements for multiplicative comparisons.</p> <p>Example:</p> <p>$5 \times 8 = 40$</p> <p>Sally is five years old. Her mom is eight times older. How old is Sally’s Mom?</p> <p>$5 \times 5 = 25$</p> <p>Sally has five times as many pencils as Mary. If Sally has 5 pencils, how many does Mary have?</p>		
ESSENTIAL QUESTION(S)	How can I represent mathematics in an equation to solve a problem?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Know multiplication strategies.	Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations.	
EXPLANATIONS AND EXAMPLES	A multiplicative comparison is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., “a is n times as much as b”). Students should be able to identify and verbalize which quantity is being multiplied and which number tells how many times.		

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STANDARD AND DECONSTRUCTION

4.OA.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.

DESCRIPTION

This standard calls for students to translate comparative situations into equations with an unknown and solve.

Students need many opportunities to solve contextual problems. Refer to Glossary, Table 2 (page 89)

For more examples (table included at the end of this document for your convenience)

In a multiplicative comparison, the underlying question is what amount would be added to one quantity in order to result in the other. In a multiplicative comparison, the underlying question is what factor would multiply one quantity in order to result in the other.

Tape diagram used to solve the Compare problem in Table 3

B is the cost of a blue hat in dollars
 R is the cost of a red hat in dollars

$\$6$ $3 \times B = R$

$\$6$ $\$6$ $\$6$ $3 \times \$6 = \18

A tape diagram used to solve a Compare problem

A big penguin will eat 3 times as much fish as a small penguin.
 The big penguin will eat 420 grams of fish. All together, how much will the two penguins eat?

420g

Big penguin:

Small penguin:

B = number of grams the big penguin eats
 S = number of grams the small penguin eats

$3 \cdot S = B$
 $3 \cdot S = 420$
 $S = 140$

$S + B = 140 + 420$
 $= 560$

(Progressions for the CCSSM; Operations and Algebraic Thinking, CCSS Writing Team, May 2011, page 29)

Examples:

Unknown Product: A blue scarf costs \$3. A red scarf costs 6 times as much. How much does the red scarf cost? ($3 \times 6 = p$).

Group Size Unknown: A book costs \$18. That is 3 times more than a DVD. How much does a DVD cost? ($18 \div p = 3$ or $3 \times p = 18$).

Number of Groups Unknown: A red scarf costs \$18. A blue scarf costs \$6. How many times as much does the red scarf cost compared to the blue scarf? ($18 \div 6 = p$ or $6 \times p = 18$).

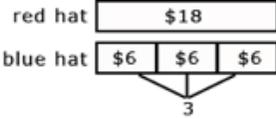
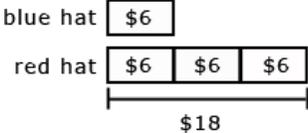
When distinguishing multiplicative comparison from additive comparison, students should note that

- additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, "How many more?"
- multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How many miles did Karen run?). A simple way to remember this is "How many times as much?" or "How many times as many?"

ESSENTIAL QUESTION(S)

How can I represent mathematics in an equation to solve a problem?

MATHEMATICS

MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.		
DOK Range Target for Instruction & Assessment	☒ 1 ☒ 2 ☐ 3 ☐ 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Describe multiplicative comparison Describe additive comparison Multiply or divide to solve word problems.	Determine and use a variety of representations to model a problem involving multiplicative comparison. Distinguish between multiplicative comparison and additive comparison (repeated addition). Determine appropriate operation and solve word problems involving multiplicative comparison.	
EXPLANATIONS AND EXAMPLES	<p>Students need many opportunities to solve contextual problems. Table 2 includes the following multiplication problem:</p> <p>“A blue hat costs \$6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?”</p> <p>In solving this problem, the student should identify \$6 as the quantity that is being multiplied by 3. The student should write the problem using a symbol to represent the unknown. ($\\$6 \times 3 = \quad$)</p> <div style="text-align: center;">  </div> <p>Table 2 includes the following division problem:</p> <p>A red hat costs \$18 and a blue hat costs \$6. How many times as much does the red hat cost as the blue hat?</p> <p>In solving this problem, the student should identify \$18 as the quantity being divided into shares of \$6. The student should write the problem using a symbol to represent the unknown. ($\\$18 \div \\$6 = \quad$)</p> <div style="text-align: center;">  </div> <p>When distinguishing multiplicative comparison from additive comparison, students should note that additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, “How many more?” multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How many miles did Karen run?). A simple way to remember this is “How many times as much?” or “How many times as many?”</p>		

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LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

4.OA.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.

DESCRIPTION

The focus in this standard is to have students use and discuss various strategies. It refers to estimation strategies, including using compatible numbers (numbers that sum to 10 or 100) or rounding. Problems should be structured so that all acceptable estimation strategies will arrive at a reasonable answer. Students need many opportunities solving multistep story problems using all four operations.

Example:

On a vacation, your family travels 267 miles on the first day, 194 miles on the second day and 34 miles on the third day. How many miles did they travel total?

Some typical estimation strategies for this problem:

Student 1

I first thought about 267 and 34. I noticed that their sum is about 300. Then I knew that 194 is close to 200. When I put 300 and 200 together, I get 500.

Student 2

I first thought about 194. It is really close to 200. I also have 2 hundreds in 267. That gives me a total of 4 hundreds. Then I have 67 in 267 and the 34. When I put 67 and 34 together that is really close to 100. When I add that hundred to the 4 hundreds that I already had, I end up with 500.

Student 3

I rounded 267 to 300. I rounded 194 to 200. I rounded 34 to 30. When I added 300, 200 and 30, I know my answer will be about 530. The assessment of estimation strategies should only have one reasonable answer (500 or 530), or a range (between 500 and 550). Problems will be structured so that all acceptable estimation strategies will arrive at a reasonable answer.

Example 2:

Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 packs with 6 bottles in each container. Sarah wheels in 6 packs with 6 bottles in each container. About how many bottles of water still need to be collected?

Student 1

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 plus 36 is about 50. I'm trying to get to 300. 50 plus another 50 is 100. Then I need 2 more hundreds. So we still need 250 bottles.

Student 2

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 is about 20 and 36 is about 40. $40+20=60$. $300-60=240$, so we need about 240 more bottles.

DESCRIPTION (continued)

This standard references interpreting remainders. Remainders should be put into context for interpretation. Ways to address remainders:

- Remain as a left over
- Partitioned into fractions or decimals
- Discarded leaving only the whole number answer
- Increase the whole number answer up one
- Round to the nearest whole number for an approximate result

Example:

Write different word problems involving $44 \div 6 = ?$ where the answers are best represented as:

Problem A: 7

Problem B: $7 \text{ r } 2$

Problem C: 8

Problem D: 7 or 8

Possible solutions:

Problem A: 7. Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches did she fill? $44 \div 6 = p$; $p = 7 \text{ r } 2$. Mary can fill 7 pouches completely.

Problem B: $7 \text{ r } 2$. Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches could she fill and how many pencils would she have left? $44 \div 6 = p$; $p = 7 \text{ r } 2$; Mary can fill 7 pouches and have 2 left over.

Problem C: 8. Mary had 44 pencils. Six pencils fit into each of her pencil pouches. What would the fewest number of pouches she would need in order to hold all of her pencils? $44 \div 6 = p$; $p = 7 \text{ r } 2$; Mary can needs 8 pouches to hold all of the pencils.

Problem D: 7 or 8. Mary had 44 pencils. She divided them equally among her friends before giving one of the leftovers to each of her friends. How many pencils could her friends have received? $44 \div 6 = p$; $p = 7 \text{ r } 2$; Some of her friends received 7 pencils. Two friends received 8 pencils.

Problem E: $7 \frac{2}{6}$ Mary had 44 pencils and put six pencils in each pouch. What fraction represents the number of pouches that Mary filled? $44 \div 6 = p$; $p = 7 \frac{2}{6}$

Example:

There are 128 students going on a field trip. If each bus held 30 students, how many buses are needed? ($128 \div 30 = b$;

$b = 4 \text{ R } 8$; they will need 5 buses because 4 busses would not hold all of the students).

Students need to realize in problems, such as the example above, that an extra bus is needed for the 8 students that are left over.

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LEXILE GRADE LEVEL BAND: 740L TO 940L

<p>DESCRIPTION (continued)</p>	<p>Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies include, but are not limited to:</p> <ul style="list-style-type: none"> • front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts), • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), • using friendly or compatible numbers such as factors (students seek to fit numbers together - e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000), • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate). 		
<p>ESSENTIAL QUESTION(S)</p>	<p>How can I represent mathematics in an equation to solve a problem?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.1. Make sense of problems and persevere in solving them. 4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Divide whole numbers including division with remainders.</p>	<p>Represent multi-step word problems using equations with a letter standing for the unknown quantity.</p> <p>Interpret multi-step word problems (including problems in which remainders must be interpreted) and determine the appropriate operations to solve.</p> <p>Assess the reasonableness of an answer in solving a multi-step word problem using mental math and estimation strategies (including rounding).</p>	

EXPLANATIONS AND EXAMPLES

Students need many opportunities solving multistep story problems using all four operations.

An interactive whiteboard, document camera, drawings, words, numbers, and/or objects may be used to help solve story problems.

Example:

Chris bought clothes for school. She bought 3 shirts for \$12 each and a skirt for \$15. How much money did Chris spend on her new school clothes?

$$3 \times \$12 + \$15 = a$$

In division problems, the remainder is the whole number left over when as large a multiple of the divisor as possible has been subtracted.

Example:

Kim is making candy bags. There will be 5 pieces of candy in each bag. She had 53 pieces of candy. She ate 14 pieces of candy. How many candy bags can Kim make now?

(7 bags with 4 leftover)

Kim has 28 cookies. She wants to share them equally between herself and 3 friends. How many cookies will each person get?

(7 cookies each) $28 \div 4 = a$

There are 29 students in one class and 28 students in another class going on a field trip. Each car can hold 5 students. How many cars are needed to get all the students to the field trip?

(12 cars, one possible explanation is 11 cars holding 5 students and the 12th holding the remaining 2 students) $29 + 28 = 11 \times 5 + 2$

Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies include, but are not limited to: front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts), clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), using friendly or compatible numbers such as factors (students seek to fit numbers together - e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000), • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

CLUSTER:	2. Gain familiarity with factors and multiples.
BIG IDEA:	Numbers can be used in various ways through factors, multiples and patterns. Factors, numbers and multiples help to develop varied uses for numbers.
ACADEMIC VOCABULARY:	multiplication/multiply, division/divide, factor pairs, factor, multiple, prime, composite

STANDARD AND DECONSTRUCTION

4.OA.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.		
DESCRIPTION	<p>This standard requires students to demonstrate understanding of factors and multiples of whole numbers. This standard also refers to prime and composite numbers. Prime numbers have exactly two factors, the number one and their own number. For example, the number 17 has the factors of 1 and 17. Composite numbers have more than two factors. For example, 8 has the factors 1, 2, 4, and 8.</p> <p>A common misconception is that the number 1 is prime, when in fact; it is neither prime nor composite. Another common misconception is that all prime numbers are odd numbers. This is not true, since the number 2 has only 2 factors, 1 and 2, and is also an even number.</p>		
ESSENTIAL QUESTION(S)	How can I represent mathematics in an equation to solve a problem?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.7. Look for and make use of structure.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Define prime and composite numbers. Concepts/Skills: Know strategies to determine whether a whole number is prime or composite. Identify all factor pairs for any given number 1-100. Determine if a given whole number (1-100) is a multiple of a given one-digit number.	Determine if a given whole number (1-100) is a multiple of a given one-digit number. Evaluate if a given whole number (1-100) is prime or composite.	

EXPLANATIONS AND EXAMPLES

Students should understand the process of finding factor pairs so they can do this for any number 1 -100,
Example:

Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12.

Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20).

Example:

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

Multiples : 1,2,3,4,5...24

2,4,6,8,10,12,14,16,18,20,22,24

3,6,9,12,15,18,21,24

4,8,12,16,20,24

8,16,24

12,24

24

To determine if a number between 1-100 is a multiple of a given one-digit number, some helpful hints include the following: all even numbers are multiples of 2

all even numbers that can be halved twice (with a whole number result) are multiples of 4

all numbers ending in 0 or 5 are multiples of 5

Prime vs. Composite:

A prime number is a number greater than 1 that has only 2 factors, 1 and itself. Composite numbers have more than 2 factors.

Students investigate whether numbers are prime or composite by

building rectangles (arrays) with the given area and finding which numbers have more than two

rectangles (e.g. 7 can be made into only 2 rectangles, 1×7 and 7×1 , therefore it is a prime number)

finding factors of the number

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

CLUSTER: 3. Generate and analyze patterns.

Generate and analyze patterns.

BIG IDEA: Numeric patterns and relationships can be described by mathematical rules and extending them can solve real-world problems.

ACADEMIC VOCABULARY: Pattern (number or shape) Pattern rule

STANDARD AND DECONSTRUCTION

4.OA.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.

DESCRIPTION

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

Example:

There are 4 beans in the jar. Each day 3 beans are added. How many beans are in the jar for each of the first 5 days?

Day	Operation	Beans
0	$3 \times 0 + 4$	4
1	$3 \times 1 + 4$	7
2	$3 \times 2 + 4$	10
3	$3 \times 3 + 4$	13
4	$3 \times 4 + 4$	16
5	$3 \times 5 + 4$	19

This standard begins with a small focus on reasoning about a number or shape pattern, connecting a rule for a given pattern with its sequence of numbers or shapes. Patterns that consist of repeated sequences of shapes or growing sequences of designs can be appropriate for the grade. For example, students could examine a sequence of dot designs in which each design has 4 more dots than the previous one and they could reason about how the dots are organized in the design to determine the total number of dots in the 100th design. In examining numerical sequences, fourth graders can explore rules of repeatedly adding the same whole number or repeatedly multiplying by the same whole number. Properties of repeating patterns of shapes can be explored with division. For example, to determine the 100th shape in a pattern that consists of repetitions of the sequence “square, circle, triangle,” the fact that when we divide 100 by 3 the whole number quotient is 33 with remainder 1 tells us that after 33 full repeats, the 99th shape will be a triangle (the last shape in the repeating pattern), so the 100th shape is the first shape in the pattern, which is a square. Notice that the Standards do not require students to infer or guess the underlying rule for a pattern, but rather ask them to generate a pattern from a given rule and identify features of the given pattern. (Progressions for the CCSSM; Operations and Algebraic Thinking, CCSS Writing Team, May 2011, page 31)

MATHEMATICS

ESSENTIAL QUESTION(S)	Where can you see patterns in our world (music, art, architecture, nature, words, numbers)?											
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.											
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4											
Instructional Targets	Know: Concepts/Skills	Think	Do									
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application									
Students should be able to:	Identify a number or shape pattern.	Analyze a pattern to determine features not apparent in the rule Generate a number or shape pattern that follows a given rule.										
EXPLANATIONS AND EXAMPLES	<p>Patterns and rules are related. A pattern is a sequence that repeats the same process over and over. A rule dictates what that process will look like. Students investigate different patterns to find rules, identify features in the patterns, and justify the reason for those features.</p> <p>Example:</p> <table border="0" data-bbox="451 1079 1495 1318"> <thead> <tr> <th>Pattern</th> <th>Rule</th> <th>Feature(s)</th> </tr> </thead> <tbody> <tr> <td>3, 8, 13, 18, 23, 28, ...</td> <td>Start with 3, add 5</td> <td>The numbers alternately end with a 3 or 8</td> </tr> <tr> <td>5, 10, 15, 20 ...</td> <td>Start with 5, add 5</td> <td>The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number. The numbers that end in 0 are products of 5 and an even number.</td> </tr> </tbody> </table> <p>After students have identified rules and features from patterns, they need to generate a numerical or shape pattern from a given rule.</p> <p>Example: Rule: Starting at 1, create a pattern that starts at 1 and multiplies each number by 3. Stop when you have 6 numbers.</p> <p>Students write 1, 3, 9, 27, 81, 243. Students notice that all the numbers are odd and that the sums of the digits of the 2 digit numbers are each 9. Some students might investigate this beyond 6 numbers. Another feature to investigate is the patterns in the differences of the numbers (3 - 1 = 2, 9 - 3 = 6, 27 - 9 = 18, etc.)</p> <p>This standard calls for students to describe features of an arithmetic number pattern or shape pattern by identifying the rule, and features that are not explicit in the rule. A t-chart is a tool to help students see number patterns.</p>			Pattern	Rule	Feature(s)	3, 8, 13, 18, 23, 28, ...	Start with 3, add 5	The numbers alternately end with a 3 or 8	5, 10, 15, 20 ...	Start with 5, add 5	The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number. The numbers that end in 0 are products of 5 and an even number.
Pattern	Rule	Feature(s)										
3, 8, 13, 18, 23, 28, ...	Start with 3, add 5	The numbers alternately end with a 3 or 8										
5, 10, 15, 20 ...	Start with 5, add 5	The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number. The numbers that end in 0 are products of 5 and an even number.										

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

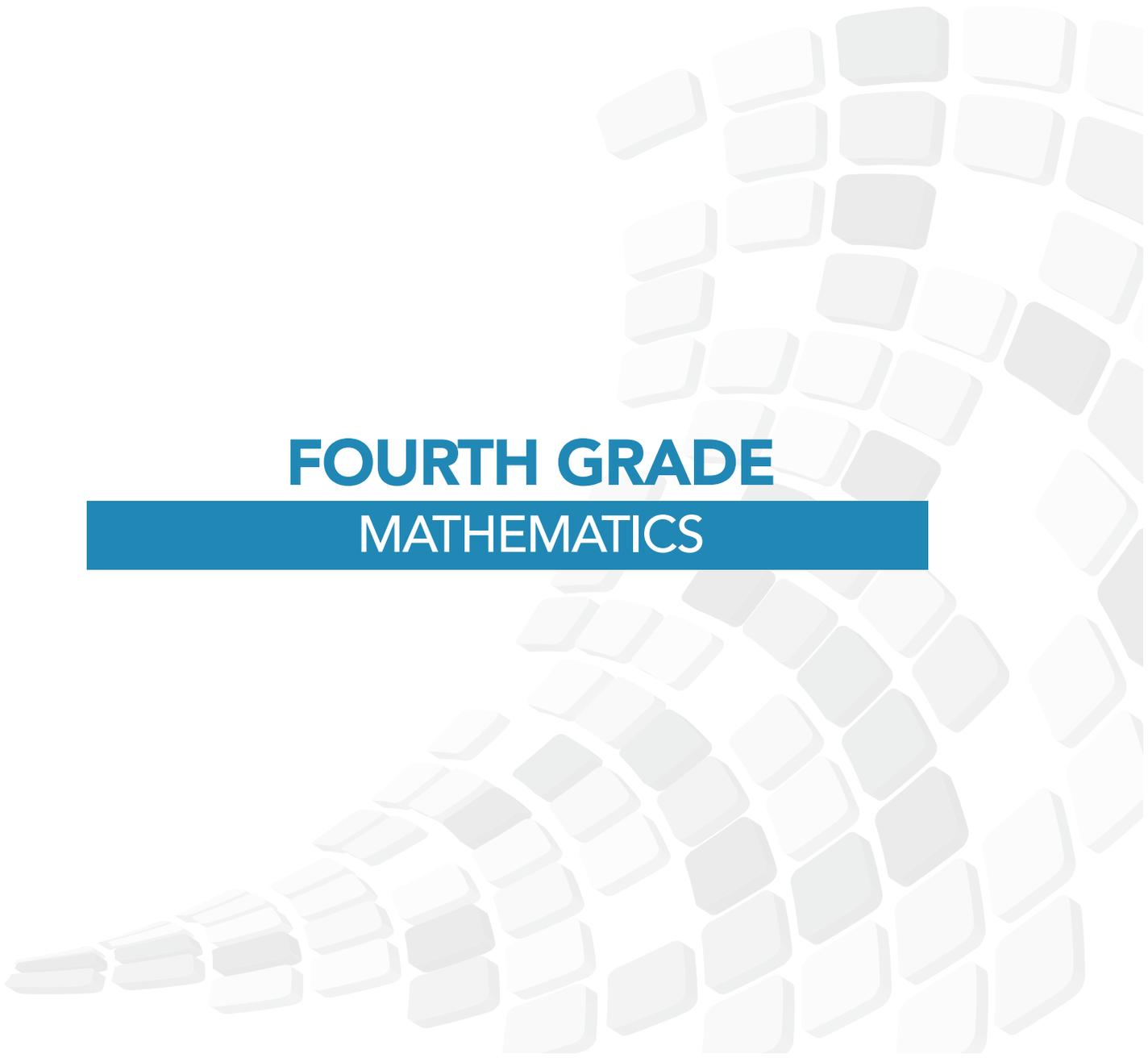


DOMAIN:

**NUMBER &
OPERATION IN BASE
TEN (NBT)**

FOURTH GRADE

MATHEMATICS



MATHEMATICS

DOMAIN

Number and Operation in Base Ten (NBT)

CLUSTERS

1. Generalize place value understanding for multidigit whole numbers.
2. Use place value understanding and properties of operations to perform multi-digit arithmetic.

NUMBER & OPERATIONS IN BASE TEN (NBT)

THIRD	FOURTH	FIFTH
Place Value and Decimals		
Three-digit Whole Numbers	Three-digit Whole Numbers	Three-digit Whole Numbers
3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.		
3.NBT.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.		
Multi-digit Whole Numbers	Multi-digit Whole Numbers	Multi-digit Whole Numbers
	4.NBT.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.	
	4.NBT.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.3 Use place value understanding to round multi-digit whole numbers to any place.	
Decimal Numbers, Integer Exponents, and Scientific Notation	Decimal Numbers, Integer Exponents, and Scientific Notation	Decimal Numbers, Integer Exponents, and Scientific Notation
	4.NF.6 Use decimal notation for fractions with denominators 10 or 100.	5.NBT.3.a Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
	4.NF.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.	5.NBT.3.b Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
		5.NBT.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.
		5.NBT.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.4 Use place value understanding to round decimals to any place.
		5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, and explain.

NUMBER & OPERATION IN BASE TEN (NBT)

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

NUMBER & OPERATIONS IN BASE TEN (NBT)

THIRD	FOURTH	FIFTH
Time and Money		
Section 1: Time	Section 1: Time	Section 1: Time
3.NBT.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.	4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	
Addition and Subtraction		
Addition and Subtraction Within 1000	Addition and Subtraction Within 1000	Addition and Subtraction Within 1000
3.NBT.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.	4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	
Multiplication and Division		
Section 1: Understanding and Relating Multiplication and Division Operations	Section 1: Understanding and Relating Multiplication and Division Operations	Section 1: Understanding and Relating Multiplication and Division Operations
3.OA.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.	4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ 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.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ 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.	4.OA.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.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.6 Understand division as an unknown-factor problem.		
Multiplication and Division Properties and Facts	Multiplication and Division Properties and Facts	Multiplication and Division Properties and Facts
3.OA.5 Apply properties of operations as strategies to multiply and divide. Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$ (Distributive property.)		
3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.		

MATHEMATICS

NUMBER & OPERATIONS IN BASE TEN (NBT)

THIRD	FOURTH	FIFTH
Factors and Multiples	Factors and Multiples	Factors and Multiples
	4.OA.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.	5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.
		5.NBT.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.
	4.NBT.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.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.OA.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.	

NUMBER & OPERATION IN BASE TEN (NBT)

Source: turnonccmath.net, NC State University College of Education

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

CLUSTER: 1. Generalize place value understanding for multi-digit whole numbers.

Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

BIG IDEA: Deep understanding of place value is needed to understand and use multi-digit whole numbers (operations, equations, rectangular arrays, area models).

ACADEMIC VOCABULARY: place value, greater than, less than, equal to, $<$, $>$, $=$, comparisons/compare, round

STANDARD AND DECONSTRUCTION

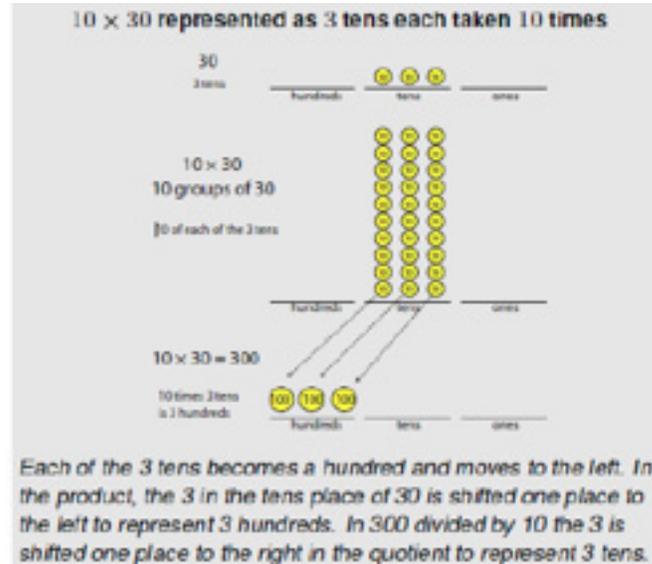
4.NBT.1

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 $700 \div 70 = 10$ by applying concepts of place value and division.

DESCRIPTION

This standard calls for students to extend their understanding of place value related to multiplying and dividing by multiples of 10. In this standard, students should reason about the magnitude of digits in a number. Students should be given opportunities to reason and analyze the relationships of numbers that they are working with.

In the base-ten system, the value of each place is 10 times the value of the place to the immediate right. Because of this, multiplying by 10 yields a product in which each digit of the multiplicand is shifted one place to the left.



(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 12)

Example:

How is the 2 in the number 582 similar to and different from the 2 in the number 528?

ESSENTIAL QUESTION(S)	How does a digit's position affect its value?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	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.		
EXPLANATIONS AND EXAMPLES	<p>Students should be familiar with and use place value as they work with numbers. Some activities that will help students develop understanding of this standard are:</p> <p>Investigate the product of 10 and any number, then justify why the number now has a 0 at the end. ($7 \times 10 = 70$ because 70 represents 7 tens and no ones, $10 \times 35 = 350$ because the 3 in 350 represents 3 hundreds, which is 10 times as much as 3 tens, and the 5 represents 5 tens, which is 10 times as much as 5 ones.) While students can easily see the pattern of adding a 0 at the end of a number when multiplying by 10, they need to be able to justify why this works.</p> <p>Investigate the pattern, 6, 60, 600, 6,000, 60,000, 600,000 by dividing each number by the previous number.</p>		



FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

<p>4.NBT.2</p>	<p>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.</p>		
<p>DESCRIPTION</p>	<p>This standard refers to various ways to write numbers. Students should have flexibility with the different number forms. Traditional expanded form is $285 = 200 + 80 + 5$. Written form or number name is two hundred eighty five. However, students should have opportunities to explore the idea that 285 could also be 28 tens plus 5 ones or 1 hundred, 18 tens, and 5 ones.</p> <p>To read numerals between 1,000 and 1,000,000, students need to understand the role of commas. Each sequence of three digits made by commas is read as hundreds, tens, and ones, followed by the name of the appropriate base-thousand unit (thousand, million, billion, trillion, etc.). Thus, 457,000 is read “four hundred fifty seven thousand.” The same methods students used for comparing and rounding numbers in previous grades apply to these numbers, because of the uniformity of the base-ten system. (Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 12)</p> <p>Students should also be able to compare two multi-digit whole numbers using appropriate symbols.</p>		
<p>ESSENTIAL QUESTION(S)</p>	<p>How does a digit’s position affect its value?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form.</p>	<p>Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.</p>	
<p>EXPLANATIONS AND EXAMPLES</p>	<p>The expanded form of 275 is $200 + 70 + 5$. Students use place value to compare numbers. For example, in comparing 34,570 and 34,192, a student might say, both numbers have the same value of 10,000s and the same value of 1000s however, the value in the 100s place is different so that is where I would compare the two numbers.</p>		

STANDARD AND DECONSTRUCTION

4.NBT.3

Use place value understanding to round multi-digit whole numbers to any place.

DESCRIPTION

This standard refers to place value understanding, which extends beyond an algorithm or procedure for rounding. The expectation is that students have a deep understanding of place value and number sense and can explain and reason about the answers they get when they round. Students should have numerous experiences using a number line and a hundreds chart as tools to support their work with rounding.

Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 packs with 6 bottles in each container. Sarah wheels in 6 packs with 6 bottles in each container. About how many bottles of water still need to be collected?

Student 1

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 plus 36 is about 50. I'm trying to get to 300. 50 plus another 50 is 100. Then I need 2 more hundreds. So we still need 250 bottles.

Student 2

First, I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 is about 20 and 36 is about 40. $40+20=60$. $300-60=240$, so we need about 240 more bottles.

Example:

On a vacation, your family travels 267 miles on the first day, 194 miles on the second day and 34 miles on the

third day. How many total miles did they travel?

Some typical estimation strategies for this problem:

Student 1

I first thought about 267 and 34. I noticed that their sum is about 300. Then I knew that 194 is close to 200. When I put 300 and 200 together, I get 500.

Student 2

I first thought about 194. It is really close to 200. I also have 2 hundreds in 267. That gives me a total of 4 hundreds. Then I have 67 in 267 and the 34. When I put 67 and 34 together that is really close to 100. When I add that hundred to the 4 hundreds that I already had, I end up with 500.

Student 3

I rounded 267 to 300. I rounded 194 to 200. I rounded 34 to 30. When I added 300, 200 and 30, I know my answer will be about 530.

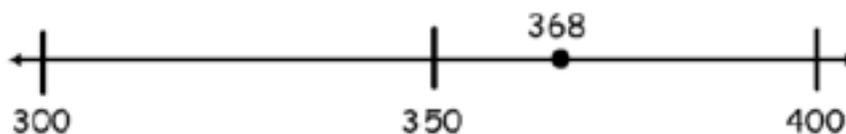
Example:

Round 368 to the nearest hundred.

This will either be 300 or 400, since those are the two hundreds before and after 368.

Draw a number line, subdivide it as much as necessary, and determine whether 368 is closer to 300 or 400.

Since 368 is closer to 400, this number should be rounded to 400



FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S)	How does a digit's position affect its value?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.6. Attend to precision		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Round multi-digit whole numbers to any place using place value.		
EXPLANATIONS AND EXAMPLES	<p>When students are asked to round large numbers, they first need to identify which digit is in the appropriate place.</p> <p>Example: Round 76,398 to the nearest 1000. Step 1: Since I need to round to the nearest 1000, then the answer is either 76,000 or 77,000. Step 2: I know that the halfway point between these two numbers is 76,500. Step 3: I see that 76,398 is between 76,000 and 76,500. Step 4: Therefore, the rounded number would be 76,000.</p>		

STANDARD AND DECONSTRUCTION

4.NBT.4

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

DESCRIPTION

Students build on their understanding of addition and subtraction, their use of place value and their flexibility with multiple strategies to make sense of the standard algorithm. They continue to use place value in describing and justifying the processes they use to add and subtract.

This standard refers to fluency, which means accuracy, efficiency (using a reasonable amount of steps and time), and flexibility (using a variety strategies such as the distributive property). This is the first grade level in which students are expected to be proficient at using the standard algorithm to add and subtract. However, other previously learned strategies are still appropriate for students to use.

Computation algorithm. A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly.

Computation strategy. Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 2)

In mathematics, an algorithm is defined by its steps and not by the way those steps are recorded in writing. With this in mind, minor variations in methods of recording standard algorithms are acceptable. As with addition and subtraction, students should use methods they understand and can explain. Visual representations such as area and array diagrams that students draw and connect to equations and other written numerical work are useful for this purpose. By reasoning repeatedly about the connection between math drawings and written numerical work, students can come to see multiplication and division algorithms as abbreviations or summaries of their reasoning about quantities.

Students can invent and use fast special strategies while also working towards understanding general methods and the standard algorithm.

One component of understanding general methods for multiplication is understanding how to compute products of one-digit numbers and multiples of 10, 100, and 1000. This extends work in Grade 3 on products of one-digit numbers and multiples of 10. We can calculate 6×700 by calculating 6×7 and then shifting the result to the left two places (by placing two zeros at the end to show that these are hundreds) because 6 groups of 7 hundred is 6 \times 7 hundreds, which is 42 hundreds, or 4,200. Students can use this place value reasoning, which can also be supported with diagrams of arrays or areas, as they develop and practice using the patterns in relationships among products such as 6×7 , 6×70 , 6×700 , and 6×7000 . Products of 5 and even numbers, such as 5×4 , 5×40 , 5×400 , 5×4000 and 4×5 , 4×50 , 4×500 , 4×5000 might be discussed and practiced separately afterwards because they may seem at first to violate the patterns by having an "extra" 0 that comes from the one-digit product.

Computation of 8×549 connected with an area model

$549 = 500$	$+ 40$	$+ 9$
$8 \times 500 =$	$8 \times 40 =$	$8 \times 9 =$
$8 \times 5 \text{ hundreds} =$	$8 \times 4 \text{ tens} =$	72
40 hundreds	32 tens	

Each part of the region above corresponds to one of the terms in the computation below.

$$8 \times 549 = 8 \times (500 + 40 + 9)$$

$$= 8 \times 500 + 8 \times 40 + 8 \times 9.$$

This can also be viewed as finding how many objects are in 8 groups of 549 objects, by finding the cardinalities of 8 groups of 500, 8 groups of 40, and 8 groups of 9, then adding them.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 13)

Computation of 8×549 : Ways to record general methods

<p>Left to right showing the partial products</p> $\begin{array}{r} 549 \\ \times 8 \\ \hline 4000 \\ 320 \\ 72 \\ \hline 4392 \end{array}$ <p><i>thinking:</i> $8 \times 5 \text{ hundreds}$ $8 \times 4 \text{ tens}$ 8×9</p>	<p>Right to left showing the partial products</p> $\begin{array}{r} 549 \\ \times 8 \\ \hline 72 \\ 320 \\ 4000 \\ \hline 4392 \end{array}$ <p><i>thinking:</i> 8×9 $8 \times 4 \text{ tens}$ $8 \times 5 \text{ hundreds}$</p>	<p>Right to left recording the carries below</p> $\begin{array}{r} 549 \\ \times 8 \\ \hline 37 \\ 4022 \\ \hline 4392 \end{array}$ <p><i>thinking:</i> $8 \times 9 = 72$ is written diagonally to the left of the 2 rather than above the 4 in 549.</p>
--	--	--

The first method proceeds from left to right, and the others from right to left. In the third method, the digits representing new units are written below the line rather than above 549, thus keeping the digits of the products close to each other, e.g., the 7 from $8 \times 9 = 72$ is written diagonally to the left of the 2 rather than above the 4 in 549.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 13)

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S)	Why is the standard algorithm an efficient method for addition and subtraction?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure. 4.MP.8. Look for and express regularity in repeated reasoning.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Fluently add and subtract multi-digit whole numbers less than or equal to 1,000,000 using the standard algorithm.		
EXPLANATIONS AND EXAMPLES	<p>Students build on their understanding of addition and subtraction, their use of place value and their flexibility with multiple strategies to make sense of the standard algorithm. They continue to use place value in describing and justifying the processes they use to add and subtract. When students begin using the standard algorithm their explanation may be quite lengthy. After much practice with using place value to justify their steps, they will develop fluency with the algorithm. Students should be able to explain why the algorithm works.</p> <p>3892 + 1567 _____</p> <p>Student explanation for this problem:</p> <ol style="list-style-type: none"> Two ones plus seven ones is nine ones. Nine tens plus six tens is 15 tens. I am going to write down five tens and think of the 10 tens as one more hundred. (notates with a 1 above the hundreds column) Eight hundreds plus five hundreds plus the extra hundred from adding the tens is 14 hundreds. I am going to write the four hundreds and think of the 10 hundreds as one more 1000. (notates with a 1 above the thousands column) Three thousands plus one thousand plus the extra thousand from the hundreds is five thousand. <p>3546 - 928 _____</p> <p>Student explanation for this problem:</p> <ol style="list-style-type: none"> There are not enough ones to take 8 ones from 6 ones so I have to use one ten as 10 ones. Now I have 3 tens and 16 ones. (Marks through the 4 and notates with a 3 above the 4 and writes a 1 above the ones column to be represented as 16 ones.) Sixteen ones minus 8 ones is 8 ones. (Writes an 8 in the ones column of answer.) Three tens minus 2 tens is one ten. (Writes a 1 in the tens column of answer.) There are not enough hundreds to take 9 hundreds from 5 hundreds so I have to use one thousand as 10 hundreds. (Marks through the 3 and notates with a 2 above it. (Writes down a 1 above the hundreds column.) Now I have 2 thousand and 15 hundreds. Fifteen hundreds minus 9 hundreds is 6 hundreds. (Writes a 6 in the hundreds column of the answer.) I have 2 thousands left since I did not have to take away any thousands. (Writes 2 in the thousands place of answer.) <p>Note: Students should know that it is mathematically possible to subtract a larger number from a smaller number but that their work with whole numbers does not allow this as the difference would result in a negative number.</p>		

STANDARD AND DECONSTRUCTION

4.NBT.5

Multiply a whole number 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.

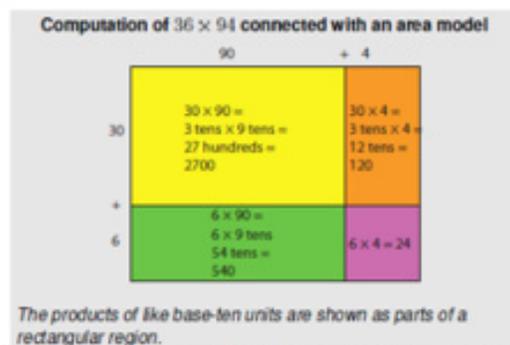
DESCRIPTION

Students who develop flexibility in breaking numbers apart have a better understanding of the importance of place value and the distributive property in multi-digit multiplication. Students use base ten blocks, area models, partitioning, compensation strategies, etc. when multiplying whole numbers and use words and diagrams to explain their thinking. They use the terms factor and product when communicating their reasoning. Multiple strategies enable students to develop fluency with multiplication and transfer that understanding to division. Use of the standard algorithm for multiplication is an expectation in the 5th grade.

Another part of understanding general base-ten methods for multi-digit multiplication is understanding the role played by the distributive property. This allows numbers to be decomposed into base-ten units, products of the units to be computed, and then combined. By decomposing the factors into like base-ten units and applying the distributive property, multiplication computations are reduced to single-digit multiplications and products of numbers with multiples of 10, of 100, and of 1000. Students can connect diagrams of areas or arrays to numerical work to develop understanding of general base-ten multiplication methods. Computing products of two two-digit numbers requires using the distributive property several times when the factors are decomposed into base-ten units.

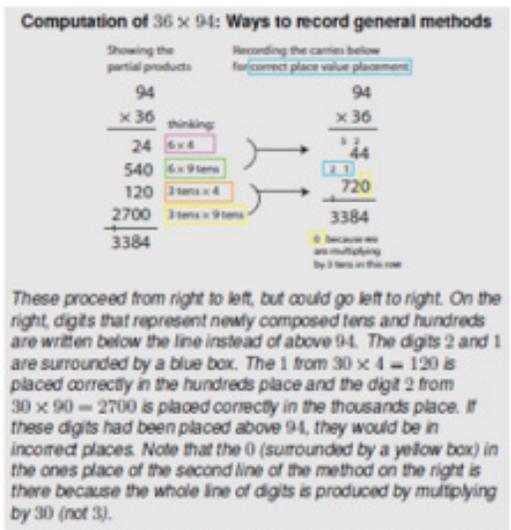
Example:

$$\begin{aligned} 36 \times 94 &= (30 + 6) \times (90 + 4) \\ &= (30 + 6) \times 90 + (30 + 6) \times 4 \\ &= 30 \times 90 + 6 \times 90 + 30 \times 4 + 6 \times 4. \end{aligned}$$



(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 14)

This standard calls for students to multiply numbers using a variety of strategies.



FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

DESCRIPTION (continued)

Example:

There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery?

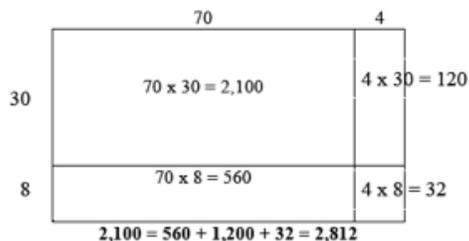
Student 1
 25×12
 I broke 12 up into 10 and 2
 $25 \times 10 = 250$
 $25 \times 2 = 50$
 $250 + 50 = 300$

Student 2
 25×12
 I broke 25 up into 5 groups of 5
 $5 \times 12 = 60$
 I have 5 groups of 5 in 25
 $60 \times 5 = 300$

Student 3
 25×12
 I doubled 25 and cut 12 in half to get 50×6
 $50 \times 6 = 300$

Example:

What would an array area model of 74×38 look like?



ESSENTIAL QUESTION(S)

What is an efficient strategy for multiplying numbers?

MATHEMATICAL PRACTICE(S)

- 4.MP.2. Reason abstractly and quantitatively.
- 4.MP.3. Construct viable arguments and critique the reasoning of others.
- 4.MP.4. Model with mathematics.
- 4.MP.5. Use appropriate tools strategically.
- 4.MP.7. Look for and make use of structure.

DOK Range Target for Instruction & Assessment

1 2 3 4

Instructional Targets

Know: Concepts/Skills

Think

Do

Assessment Types

Tasks assessing concepts, skills, and procedures

Tasks assessing expressing mathematical reasoning

Tasks assessing modeling/application

Students should be able to:

Multiply a whole number of up to four digits by a one-digit whole number.
 Multiply two two-digit numbers algorithm.

Use strategies based on place value and the properties of operations to multiply whole numbers.
 Illustrate and explain calculations by using written equations, rectangular arrays, and/or area models.

EXPLANATIONS AND EXAMPLES

Students who develop flexibility in breaking numbers apart have a better understanding of the importance of place value and the distributive property in multi-digit multiplication. Students use base ten blocks, area models, partitioning, compensation strategies, etc. when multiplying whole numbers and use words and diagrams to explain their thinking. They use the terms factor and product when communicating their reasoning. Multiple strategies enable students to develop fluency with multiplication and transfer that understanding to division. Use of the standard algorithm for multiplication is an expectation in the 5th grade.

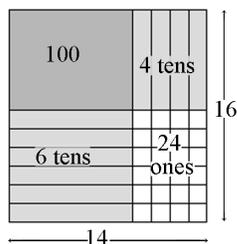
Students may use digital tools to express their ideas.

Use of place value and the distributive property are applied in the scaffolded examples below.

To illustrate 154×6 students use base 10 blocks or use drawings to show 154 six times. Seeing 154 six times will lead them to understand the distributive property, $154 \times 6 = (100 + 50 + 4) \times 6 = (100 \times 6) + (50 \times 6) + (4 \times 6) = 600 + 300 + 24 = 924$.

The area model shows the partial products.

$$14 \times 16 = 224$$



$$100 + 40 + 60 + 24 = 224$$

Students who develop flexibility in breaking numbers apart have a better understanding of the importance of place value and the distributive property in multi-digit multiplication. Students use base ten blocks, area models, partitioning, compensation strategies, etc. when multiplying whole numbers and use words and diagrams to explain their thinking. They use the terms factor and product when communicating their reasoning. Multiple strategies enable students to develop fluency with multiplication and transfer that understanding to division. Use of the standard algorithm for multiplication is an expectation in the 5th grade.

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The area model shows the partial products.

$$14 \times 16 = 224$$

Students explain this strategy and the one below with base 10 blocks, drawings, or numbers.

$$\begin{array}{r} 25 \\ \times 24 \\ \hline 400 \text{ (} 20 \times 20 \text{)} \\ 100 \text{ (} 20 \times 5 \text{)} \\ 80 \text{ (} 4 \times 20 \text{)} \\ 20 \text{ (} 4 \times 5 \text{)} \\ \hline 600 \end{array}$$

$$\begin{array}{r} 25 \\ \times 24 \\ \hline 500 \text{ (} 20 \times 25 \text{)} \\ 100 \text{ (} 4 \times 25 \text{)} \\ \hline 600 \end{array}$$

Matrix model

This model should be introduced after students have facility with the strategies shown above.

$$\begin{array}{r} 20 \quad 5 \\ 20 \quad 400 \quad 100 \quad 500 \\ 4 \quad 80 \quad 20 \quad 100 \\ \hline 480 + 120 \quad 600 \end{array}$$

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

4.NBT.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.

DESCRIPTION

In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context.

General methods for computing quotients of multi-digit numbers and one-digit numbers rely on the same understandings as for multiplication, but cast in terms of division. One component is quotients of multiples of 10, 100, or 1000 and one-digit numbers. For example, $42 \div 6$ is related to $420 \div 6$ and $4200 \div 6$. Students can draw on their work with multiplication and they can also reason that $4200 \div 6$ means partitioning 42 hundreds into 6 equal groups, so there are 7 hundreds in each group. Another component of understanding general methods for multi-digit division computation is the idea of decomposing the dividend into like base-ten units and finding the quotient unit by unit, starting with the largest unit and continuing on to smaller units. As with multiplication, this relies on the distributive property. This can be viewed as finding the side length of a rectangle (the divisor is the length of the other side) or as allocating objects (the divisor is the number of groups).

Multi-digit division requires working with remainders. In preparation for working with remainders, students can compute sums of a product and a number, such as $4 \times 8 + 3$. In multi-digit division, students will need to find the greatest multiple less than a given number. For example, when dividing by 6, the greatest multiple of 6 less than 50 is $6 \times 8 = 48$. Students can think of these “greatest multiples” in terms of putting objects into groups. For example, when 50 objects are shared among 6 groups, the largest whole number of objects that can be put in each group is 8, and 2 objects are left over. (Or when 50 objects are allocated into groups of 6, the largest whole number of groups that can be made is 8, and 2 objects are left over.) The equation $6 \times 8 + 2 = 50$ (or $8 \times 6 + 2 = 50$) corresponds with this situation.

Cases involving 0 in division may require special attention.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 14)

Cases involving 0 in division

<p>Case 1 a 0 in the dividend:</p> $\begin{array}{r} 1 \\ 6 \overline{) 901} \\ \underline{-6} \\ 3 \end{array}$ <p style="font-size: small; color: blue;">What to do about the 0?</p> <p style="font-size: small; color: pink;">3 hundreds = 30 tens</p>	<p>Case 2 a 0 in a remainder part way through:</p> $\begin{array}{r} 4 \\ 2 \overline{) 83} \\ \underline{-8} \\ 0 \end{array}$ <p style="font-size: small; color: blue;">Stop now because of the 0?</p> <p style="font-size: small; color: pink;">No, there are still 3 ones left.</p>	<p>Case 3 a 0 in the quotient:</p> $\begin{array}{r} 3 \\ 12 \overline{) 3714} \\ \underline{-36} \\ 11 \end{array}$ <p style="font-size: small; color: blue;">Stop now because 11 is less than 12?</p> <p style="font-size: small; color: pink;">No, it is 11 tens, so there are still $110 + 4 = 114$ left.</p>
--	--	---

Division as finding side length

? hundreds + ? tens + ? ones

7

966

$$\begin{array}{r} 138 \\ 7 \overline{) 966} \\ \underline{-700} \\ 266 \\ \underline{-210} \\ 56 \\ \underline{-56} \\ 0 \end{array}$$

100 + 30 + 8 = 138

966
-700
-66

266
-210
-56

56
-56
0

$$\begin{array}{r} 8 \\ 30 \\ 100 \\ \hline 138 \end{array}$$

966 \div 7 is viewed as finding the unknown side length of a rectangular region with area 966 square units and a side of length 7 units. The amount of hundreds is found, then tens, then ones. This yields a decomposition into three regions of dimensions 7 by 100, 7 by 30, and 7 by 8. It can be connected with the decomposition of 966 as $7 \times 100 + 7 \times 30 + 7 \times 8$. By the distributive property, this is $7 \times (100 + 30 + 8)$, so the unknown side length is 138. In the recording on the right, amounts of hundreds, tens, and ones are represented by numbers rather than by digits, e.g., 700 instead of 7.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 15)

DESCRIPTION (continued)

Division as finding group size

$745 \div 3 = ?$

Thinking:
Divide
7 hundreds, 4 tens, 5 ones
equally among 3 groups,
starting with hundreds.

$3 \overline{)745}$

1

3 groups

2 hundr.
2 hundr.
2 hundr.

7 hundreds - 3
each group gets
2 hundreds;
1 hundred is left.

$$\begin{array}{r} 2 \\ 3 \overline{)745} \\ \underline{-6} \\ 1 \end{array}$$

Unbundle 1 hundred.
Now I have
10 tens + 4 tens = 14 tens.

$$\begin{array}{r} 2 \\ 3 \overline{)745} \\ \underline{-6} \\ 14 \end{array}$$

2

3 groups

2 hundr. + 4 tens
2 hundr. + 4 tens
2 hundr. + 4 tens

14 tens - 3
each group gets
4 tens;
2 tens are left.

$$\begin{array}{r} 24 \\ 3 \overline{)745} \\ \underline{-6} \\ 14 \\ \underline{-12} \\ 2 \end{array}$$

Unbundle 2 tens.
Now I have
20 + 5 = 25 left.

$$\begin{array}{r} 24 \\ 3 \overline{)745} \\ \underline{-6} \\ 14 \\ \underline{-12} \\ 25 \end{array}$$

3

3 groups

2 hundr. + 4 tens + 8
2 hundr. + 4 tens + 8
2 hundr. + 4 tens + 8

25 - 3
each group gets 8;
1 is left.

$$\begin{array}{r} 248 \\ 3 \overline{)745} \\ \underline{-6} \\ 14 \\ \underline{-12} \\ 25 \\ \underline{-24} \\ 1 \end{array}$$

Each group got 248
and 1 is left.

745 ÷ 3 can be viewed as allocating 745 objects bundled in 7 hundreds, 4 tens, and 3 ones equally among 3 groups. In Step 1, the 2 indicates that each group got 2 hundreds, the 6 is the number of hundreds allocated, and the 1 is the number of hundreds not allocated. After Step 1, the remaining hundred is decomposed as 10 tens and combined with the 4 tens (in 745) to make 14 tens.

(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 15)

Example:

A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box?

- Using Base 10 Blocks: Students build 260 with base 10 blocks and distribute them into 4 equal groups.

Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.

- Using Place Value: $260 \div 4 = (200 \div 4) + (60 \div 4)$
- Using Multiplication: $4 \times 50 = 200$, $4 \times 10 = 40$, $4 \times 5 = 20$; $50 + 10 + 5 = 65$; so $260 \div 4 = 65$

This standard calls for students to explore division through various strategies.

Example:

There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many teams get created?

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

DESCRIPTION (continued)

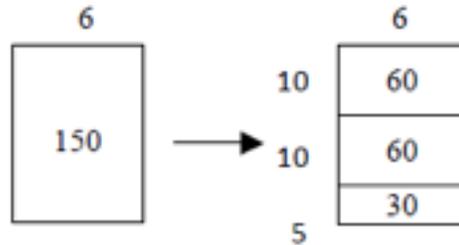
<p>Student 1 592 divided by 8 There are 70 8's in 560 $592 - 560 = 32$ There are 4 8's in 32 $70 + 4 = 74$</p>	<p>Student 2 592 divided by 8 I know that 10 8's is 80 If I take out 50 8's that is 400 $592 - 400 = 192$ I can take out 20 more 8's which is 160 $192 - 160 = 32$ 8 goes into 32 4 times I have none left I took out 50, then 20 more, then 4 more That's 74</p>	<table style="border-collapse: collapse; margin: auto;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">592</td> <td style="padding: 5px;">50</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">-400</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">192</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">-160</td> <td style="padding: 5px;">20</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">32</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">-32</td> <td style="padding: 5px;">4</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">0</td> <td style="padding: 5px;"></td> </tr> </table>	592	50	-400		192		-160	20	32		-32	4	0		<p>Student 3 I want to get to 592 $8 \times 25 = 200$ $8 \times 25 = 200$ $8 \times 25 = 200$ $200 + 200 + 200 = 600$ $600 - 8 = 592$ I had 75 groups of 8 and took one away, so there are 74 teams</p>
592	50																
-400																	
192																	
-160	20																
32																	
-32	4																
0																	

Example:

Using an Open Array or Area Model

After developing an understanding of using arrays to divide, students begin to use a more abstract model for division. This model connects to a recording process that will be formalized in the 5th grade.

Example: $150 \div 6$



Students make a rectangle and write 6 on one of its sides. They express their understanding that they need to think of the rectangle as representing a total of 150.

1. Students think, 6 times what number is a number close to 150? They recognize that 6×10 is 60 so they record 10 as a factor and partition the rectangle into 2 rectangles and label the area aligned to the factor of 10

with 60. They express that they have only used 60 of the 150 so they have 90 left.

2. Recognizing that there is another 60 in what is left they repeat the process above. They express that they have

used 120 of the 150 so they have 30 left.

3. Knowing that 6×5 is 30. They write 30 in the bottom area of the rectangle and record 5 as a factor.

4. Students express their calculations in various ways:

a.
$$\begin{array}{r} 150 \\ - 60 (6 \times 10) \\ \hline 90 \\ - 60 (6 \times 10) \\ \hline 30 \\ - 30 (6 \times 5) \\ \hline 0 \end{array}$$

$150 \div 6 = 10 + 10 + 5 = 25$

b. $150 \div 6 = (60 \div 6) + (60 \div 6) + (30 \div 6) = 10 + 10 + 5 = 25$

MATHEMATICS

<p>DESCRIPTION (continued)</p>	<p>Example: $1917 \div 9$</p> <div style="text-align: center;">  </div> <p>A student's description of his or her thinking may be: I need to find out how many 9s are in 1917. I know that 200×9 is 1800. So if I use 1800 of the 1917, I have 117 left. I know that 9×10 is 90. So if I have 10 more 9s, I will have 27 left. I can make 3 more 9s. I have 200 nines, 10 nines and 3 nines. So I made 213 nines. $1917 \div 9 = 213$.</p>		
<p>ESSENTIAL QUESTION(S)</p>	<p>What is an efficient strategy for dividing numbers?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.2. Reason abstractly and quantitatively. 4.MP.3. Construct viable arguments and critique the reasoning of others. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Find whole number quotients and remainders with up to four-digit dividends and one-digit divisors.</p>	<p>Use the strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using written equations, rectangular arrays, and/or area models.</p>	

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

EXPLANATIONS AND EXAMPLES

In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context.

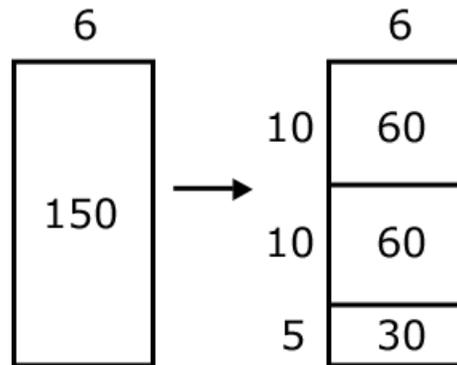
Examples:

A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box?

Using Base 10 Blocks: Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.

Using Place Value: $260 \div 4 = (200 \div 4) + (60 \div 4)$

Using Multiplication: $4 \times 50 = 200$, $4 \times 10 = 40$, $4 \times 5 = 20$; $50 + 10 + 5 = 65$; so $260 \div 4 = 65$



Students make a rectangle and write 6 on one of its sides. They express their understanding that they need to think of the rectangle as representing a total of 150.

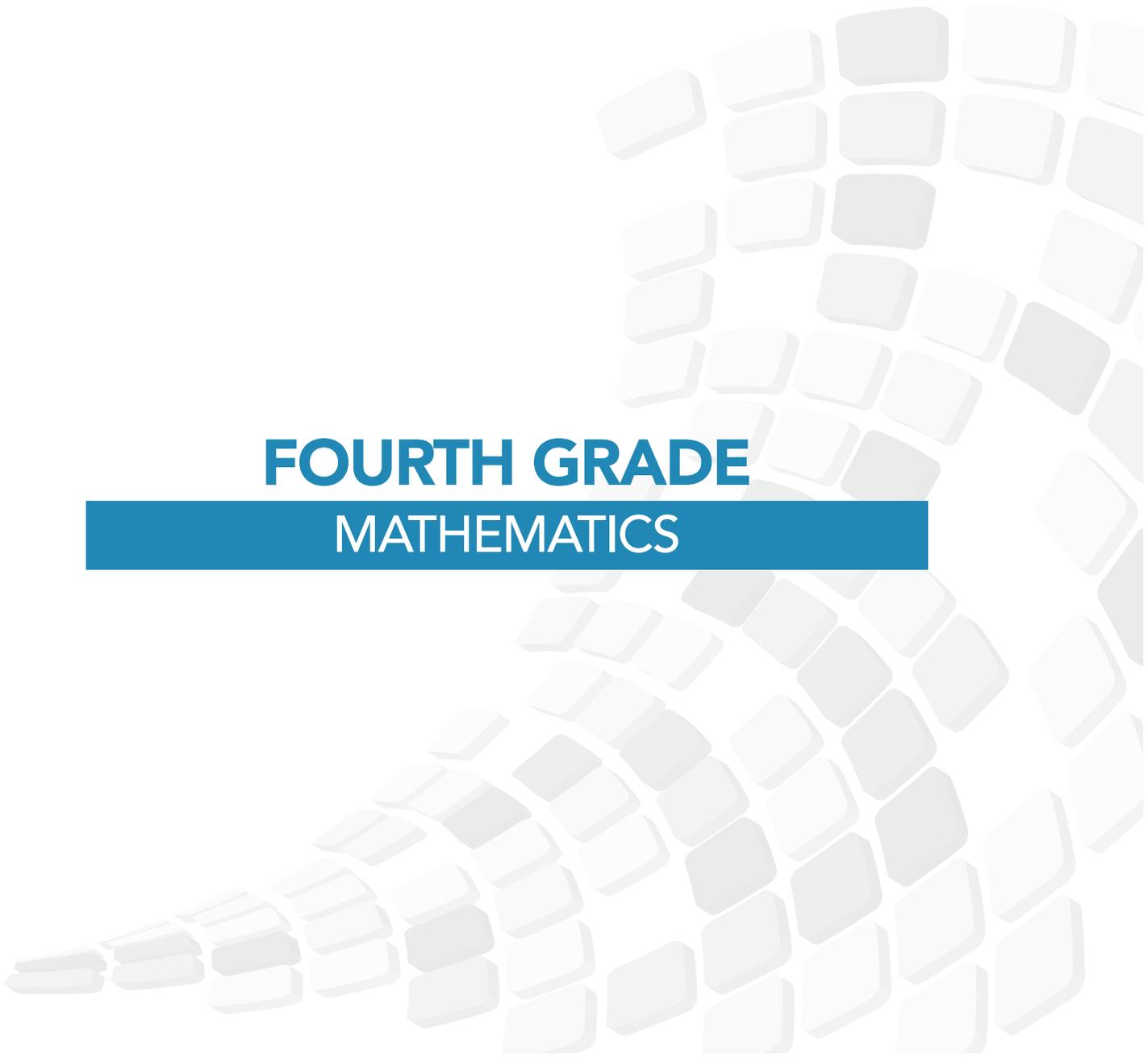
1. Students think, 6 times what number is a number close to 150? They recognize that 6×10 is 60 so they record 10 as a factor and partition the rectangle into 2 rectangles and label the area aligned to the factor of 10 with 60. They express that they have only used 60 of the 150 so they have 90 left.
2. Recognizing that there is another 60 in what is left they repeat the process above. They express that they have used 120 of the 150 so they have 30 left.
3. Knowing that 6×5 is 30. They write 30 in the bottom area of the rectangle and record 5 as a factor.

DOMAIN:

**NUMBER &
OPERATION - FRACTIONS
(NF)**

FOURTH GRADE

MATHEMATICS



MATHEMATICS

DOMAIN

Number and Operation – Fractions (NF)

CLUSTERS

1. Extend understanding of fraction equivalence and ordering.
2. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
3. Understand decimal notation for fractions, and compare decimal fractions.

NUMBER AND OPERATIONS – FRACTIONS

THIRD	FOURTH	FIFTH
Multiplication and Division		
Section 5: Multiplication and Division Problems Involving Non-Whole Rational Number Operators (Fractions)	Section 5: Multiplication and Division Problems Involving Non-Whole Rational Number Operators (Fractions)	Section 5: Multiplication and Division Problems Involving Non-Whole Rational Number Operators (Fractions)
	4.NF.4.a Understand a fraction a/b as a multiple of $1/b$.	5.NF.4.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 $a \times q \div b$.
	4.NF.4.b Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number.	5.NF.4.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.
	4.NF.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.	5.NF.5.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
		5.NF.5.a Interpret multiplication as scaling (resizing), by: 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.
		5.NF.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.7.a Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
		5.NF.7.b Interpret division of a whole number by a unit fraction, and compute such quotients.
		5.NF.7.c Solve real world problems involving division of unit fractions using visual models and equations.

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

NUMBER AND OPERATIONS – FRACTIONS

THIRD	FOURTH	FIFTH
Fractions		
Section 1: Working with Unit Fractions	Section 1: Working with Unit Fractions	Section 1: Working with Unit Fractions
3.NF.2.a Represent a fraction $1/b$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $1/b$ and that the endpoint of the part based at 0 locates the number $1/b$ on the number line.		
3.NF.2.b Represent a fraction a/b on a number line diagram by marking off a lengths of $1/b$ from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.		
Equivalence and Comparison of Fractions	Equivalence and Comparison of Fractions	Equivalence and Comparison of Fractions
3.NF.3.c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.	4.NF.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.3.b Recognize and generate simple equivalent fractions, (e.g., $1/2 = 2/4$, $4/6 = 2/3$). Explain why the fractions are equivalent (e.g., by using a visual fraction model).	4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $1/2$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $<$, $=$, or $>$, and justify the conclusions, e.g., by using a visual fraction model.	
3.NF.3.a Understand two fractions as equivalent (equal) if they are the same size or the same point on a number line.		
3.NF.3.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.		
Operations with Fractions	Operations with Fractions	Operations with Fractions
	4.NF.3.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.	5.NF.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.
	4.NF.3.a Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.	5.NF.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.
	4.NF.3.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.	
	4.NF.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.	
	4.NF.3.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.	

Source: turnonccmath.net, NC State University College of Education

MATHEMATICS

CLUSTER:

1. Extend understanding of fraction equivalence and ordering.

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.

BIG IDEA:

Models help explain how fractions are equivalent and comparable by size.

ACADEMIC VOCABULARY:

Partition(ed), fraction, unit fraction, equivalent, multiple, reason, denominator, numerator, comparison/compare, $<$, $>$, $=$, benchmark fraction.

STANDARD AND DECONSTRUCTION

4.NF.1

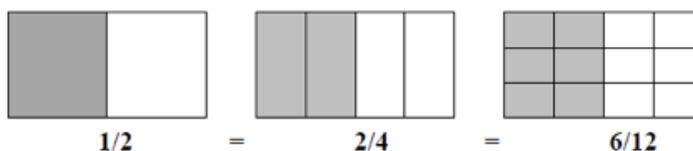
Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

DESCRIPTION

This standard refers to visual fraction models. This includes area models, number lines or it could be a collection/set model. This standard extends the work in third grade by using additional denominators. (5, 10, 12 and 100)

This standard addresses equivalent fractions by examining the idea that equivalent fractions can be created by multiplying both the numerator and denominator by the same number or by dividing a shaded region into various parts.

Example:



Using an area model to show that $\frac{2}{3} = \frac{4 \times 2}{4 \times 3}$



The whole is the square, measured by area. On the left it is divided horizontally into 3 rectangles of equal area, and the shaded region is 2 of these and so represents $\frac{2}{3}$. On the right it is divided into 4×3 small rectangles of equal area, and the shaded area comprises 4×2 of these, and so it represents $\frac{4 \times 2}{4 \times 3}$.

(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 5)

Using the number line to show that $\frac{4}{3} = \frac{5 \times 4}{5 \times 3}$



$\frac{4}{3}$ is 4 parts when each part is $\frac{1}{3}$, and we want to see that this is also 5×4 parts when each part is $\frac{1}{5 \times 3}$. Divide each of the intervals of length $\frac{1}{3}$ into 5 parts of equal length. There are 5×3 parts of equal length in the unit interval, and $\frac{4}{3}$ is 5×4 of these. Therefore $\frac{4}{3} = \frac{5 \times 4}{5 \times 3} = \frac{20}{15}$.

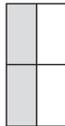
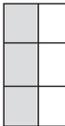
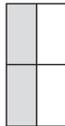
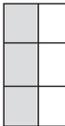
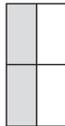
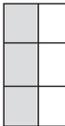
(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 5)

There is **NO** mathematical reason why fractions must be written in simplified form, although it may be convenient to do so in some cases.

Technology Connection: <http://illuminations.nctm.org/activitydetail.aspx?id=80>

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S)	How do I know when fractions are equivalent?																		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.7. Look for and make use of structure. 4.MP.8. Look for and express regularity in repeated reasoning.																		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4																		
Instructional Targets	Know: Concepts/Skills	Think	Do																
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application																
Students should be able to:	Recognize and identify equivalent fractions with unlike denominators.	Explain why a/b is equal to $(n \times a)/(n \times b)$ by using 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 visual fraction models to show why fractions are equivalent. Generate equivalent fractions using visual fraction models and explain why they can be called "equivalent."																	
EXPLANATIONS AND EXAMPLES	<p>This standard extends the work in third grade by using additional denominators (5, 10, 12, and 100).</p> <p>Students can use visual models or applets to generate equivalent fractions.</p> <p>All the models show $1/2$. The second model shows $2/4$ but also shows that $1/2$ and $2/4$ are equivalent fractions because their areas are equivalent. When a horizontal line is drawn through the center of the model, the number of equal parts doubles and size of the parts is halved.</p> <p>Students will begin to notice connections between the models and fractions in the way both the parts and wholes are counted and begin to generate a rule for writing equivalent fractions.</p> <p>$1/2 \times 2/2 = 2/4$.</p> <table style="width: 100%; text-align: center;"> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>$\frac{1}{2}$</td> <td>$\frac{2}{4} = \frac{2 \times 1}{4 \times 2}$</td> <td>$\frac{3}{6} = \frac{3 \times 1}{6 \times 2}$</td> <td>$\frac{4}{8} = \frac{4 \times 1}{8 \times 2}$</td> </tr> <tr> <td>1</td> <td>2 = 2 x 1</td> <td>3 = 3 x 1</td> <td>4 = 4 x 1</td> </tr> <tr> <td>2</td> <td>4 2 x 2</td> <td>6 3 x 2</td> <td>8 4 x 2</td> </tr> </table> <p>Technology Connection: http://illuminations.nctm.org/activitydetail.aspx?id=80</p>							$\frac{1}{2}$	$\frac{2}{4} = \frac{2 \times 1}{4 \times 2}$	$\frac{3}{6} = \frac{3 \times 1}{6 \times 2}$	$\frac{4}{8} = \frac{4 \times 1}{8 \times 2}$	1	2 = 2 x 1	3 = 3 x 1	4 = 4 x 1	2	4 2 x 2	6 3 x 2	8 4 x 2
																			
$\frac{1}{2}$	$\frac{2}{4} = \frac{2 \times 1}{4 \times 2}$	$\frac{3}{6} = \frac{3 \times 1}{6 \times 2}$	$\frac{4}{8} = \frac{4 \times 1}{8 \times 2}$																
1	2 = 2 x 1	3 = 3 x 1	4 = 4 x 1																
2	4 2 x 2	6 3 x 2	8 4 x 2																

STANDARD AND DECONSTRUCTION

4.NF.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 $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model

DESCRIPTION

This standard calls students to compare fractions by creating visual fraction models or finding common denominators or numerators. Students' experiences should focus on visual fraction models rather than algorithms. When tested, models may or may not be included. Students should learn to draw fraction models to help them compare. Students must also recognize that they must consider the size of the whole when comparing fractions (ie, $\frac{1}{8}$ of two medium pizzas is very different from $\frac{1}{8}$ of one medium and $\frac{1}{8}$ of one large).

Example:

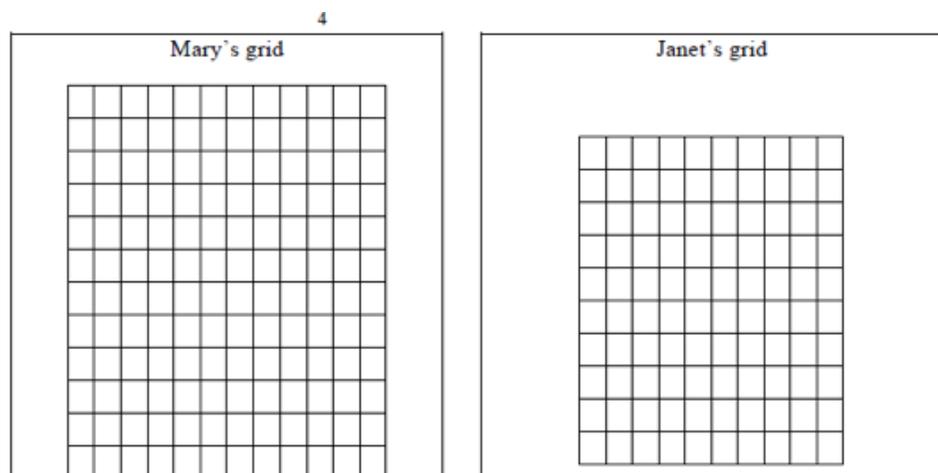
Use pattern blocks.

1. If a red trapezoid is one whole, which block shows $\frac{1}{3}$?
2. If the blue rhombus is $\frac{1}{3}$, which block shows one whole?
3. If the red trapezoid is one whole, which block shows $\frac{2}{3}$?

Mary used a 12×12 grid to represent 1 and Janet used a 10×10 grid to represent 1. Each girl shaded grid squares to show

$\frac{1}{4}$. How many grid squares did Mary shade? How many grid squares did Janet shade? Why did they need to shade different numbers of grid squares?

Possible solution: Mary shaded 36 grid squares; Janet shaded 25 grid squares. The total number of little squares is different in the two grids, so $\frac{1}{4}$ of each total number is different. Students should also be able to compare two multi-digit whole numbers using appropriate symbols.



Example:

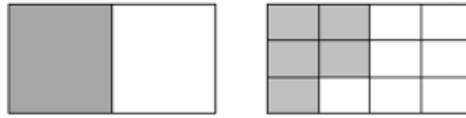
There are two cakes on the counter that are the same size. The first cake has $\frac{1}{2}$ of it left. The second cake has $\frac{5}{12}$ left. Which cake has more left?

FOURTH GRADE

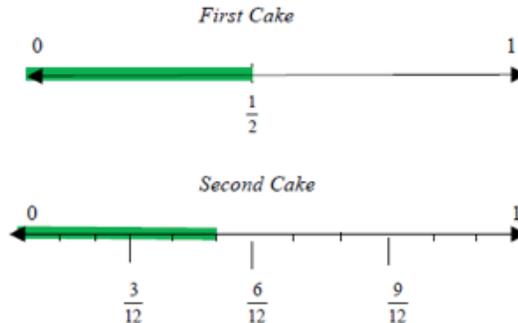
LEXILE GRADE LEVEL BAND: 740L TO 940L

DESCRIPTION (continued)

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



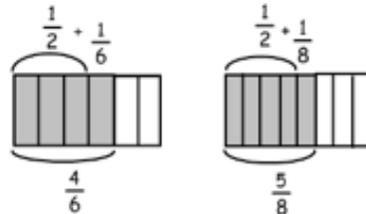
Student 2
Number Line model:



Student 3
verbal explanation:
I know that $\frac{6}{12}$ equals $\frac{1}{2}$. Therefore, the second cake which has $\frac{5}{12}$ left is less than $\frac{1}{2}$.

Example:

When using the benchmark of $\frac{1}{2}$ to compare $\frac{4}{6}$ and $\frac{5}{8}$, you could use diagrams such as these:



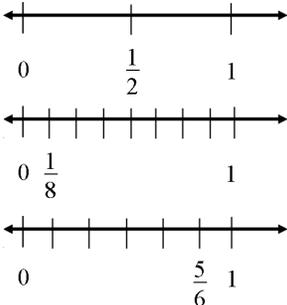
$\frac{4}{6}$ is $\frac{1}{6}$ larger than $\frac{1}{2}$, while $\frac{5}{8}$ is $\frac{1}{8}$ larger than $\frac{1}{2}$. Since $\frac{1}{6}$ is greater than $\frac{1}{8}$, $\frac{4}{6}$ is the greater fraction.

In fifth grade students who have learned about fraction multiplication can see equivalence as “multiplying by 1”:

$$\frac{7}{9} = \frac{7}{9} \times 1 = \frac{7}{9} \times \frac{4}{4} = \frac{28}{36}$$

However, although a useful mnemonic device, this does not constitute a valid argument at fourth grade, since students have not yet learned fraction multiplication. (Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 6)

MATHEMATICS

<p>ESSENTIAL QUESTION(S)</p>	<p>How can I compare two fractions? How can a common numerators and common denominators or thinking about size help me compare fractions?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Recognize fractions as being greater than, less than, or equal to other fractions</p> <p>Record comparison results with symbols: $<$, $>$, $=$</p> <p>Use benchmark fractions such as $\frac{1}{2}$ for comparison purposes</p> <p>Make comparisons based on parts of the same whole</p>	<p>Compare two fractions with different numerators or denominators by creating common denominators or comparing to a benchmark fraction</p> <p>Justify the results of a comparison of two fractions by using a visual fraction model</p>	
<p>EXPLANATIONS AND EXAMPLES</p>	<p>Benchmark fractions include common fractions between 0 and 1 such as halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths, and hundredths.</p> <p>Fractions can be compared using benchmarks, common denominators, or common numerators. Symbols used to describe comparisons include $<$, $>$, $=$.</p> <p>Fractions may be compared using $\frac{1}{2}$ as a benchmark.</p>  <p>Possible student thinking by using benchmarks:</p> <ul style="list-style-type: none"> $\frac{1}{8}$ is smaller than $\frac{1}{2}$ because when 1 whole is cut into 8 pieces, the pieces are much smaller than when 1 whole is cut into 2 pieces. <p>Possible student thinking by creating common denominators:</p> <ul style="list-style-type: none"> $\frac{5}{6} > \frac{1}{2}$ because $\frac{3}{6} = \frac{1}{2}$ and $\frac{5}{6} > \frac{3}{6}$ <p>Fractions with common denominators may be compared using the numerators as a guide.</p> <ul style="list-style-type: none"> $\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$ <p>Fractions with common numerators may be compared and ordered using the denominators as a guide.</p> <ul style="list-style-type: none"> $\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$ 		

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

CLUSTER: 2. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

BIG IDEA: Fractions are numbers where the operations on whole numbers can be applied

ACADEMIC VOCABULARY:

operations, addition/joining, subtraction/separating, fraction, unit fraction, equivalent, multiple, reason, denominator, numerator, decomposing, mixed number,(properties)-rules about how numbers work, multiply, multiple

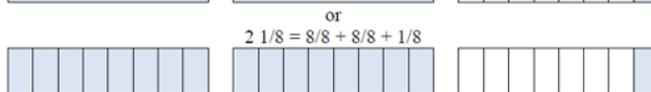
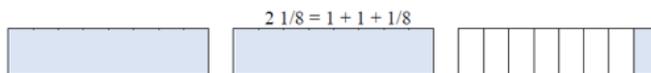
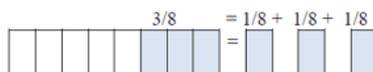
STANDARD AND DECONSTRUCTION

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

DESCRIPTION

Students should justify their breaking apart (decomposing) of fractions using visual fraction models. The concept of turning mixed numbers into improper fractions needs to be emphasized using visual fraction models.

Example:



Similarly, converting an improper fraction to a mixed number is a matter of decomposing the fraction into a sum of a whole number and a number less than 1. Students can draw on their knowledge from third grade of whole numbers as fractions.

Example, knowing that $1 = 3/3$, they see:

$$\frac{5}{3} = \frac{3}{3} + \frac{2}{3} = 1 + \frac{2}{3} = 1\frac{2}{3}$$

(Progressions for the CCSSM. Number and Operation – Fractions. CCSS Writing Team. August 2011. page 8)

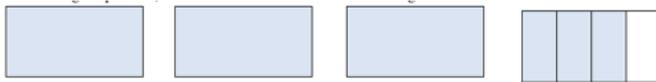
A separate algorithm for mixed numbers in addition and subtraction is not necessary. Students will tend to add or subtract the whole numbers first and then work with the fractions using the same strategies they have applied to problems that contained only fractions.

Mixed numbers are introduced for the first time in Fourth Grade. Students should have ample experiences of adding and subtracting mixed numbers where they work with mixed numbers or convert mixed numbers so that the numerator is equal to or greater than the denominator.

DESCRIPTION (continued)

Example:

While solving the problem, $3\frac{3}{4} + 2\frac{1}{4}$ students could do the following:



Student 1
 $3 + 2 = 5$ and $\frac{3}{4} + \frac{1}{4} = 1$ so $5 + 1 = 6$

Student 2
 $3\frac{3}{4} + 2 = 5\frac{3}{4}$ so $5\frac{3}{4} + \frac{1}{4} = 6$

Student 3
 $3\frac{3}{4} = \frac{15}{4}$ and $2\frac{1}{4} = \frac{9}{4}$ so $\frac{15}{4} + \frac{9}{4} = \frac{24}{4} = 6$

Fourth Grade students should be able to decompose and compose fractions with the same denominator. They add fractions with the same denominator.

Example:

$$\begin{aligned} \frac{7}{5} + \frac{4}{5} &= \overbrace{\frac{1}{5} + \dots + \frac{1}{5}}^7 + \overbrace{\frac{1}{5} + \dots + \frac{1}{5}}^4 \\ &= \frac{\overbrace{1 + 1 + \dots + 1}^{7+4}}{5} \\ &= \frac{7+4}{5} \end{aligned}$$

Using the understanding gained from work with whole numbers of the relationship between addition and subtraction, they also subtract fractions with the same denominator. For example, to subtract $\frac{5}{6}$ from $\frac{17}{6}$, they decompose.

Example: $\frac{12}{6} + \frac{5}{6}$, so $\frac{17}{6} - \frac{5}{6} = \frac{17-5}{6} = \frac{12}{6} = 2$.

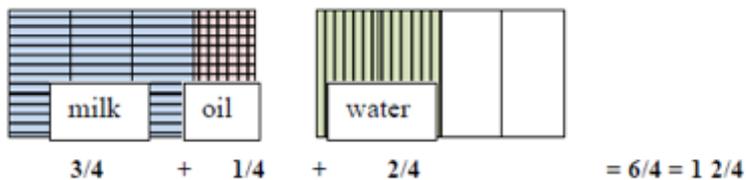
Students also compute sums of whole numbers and fractions, by representing the whole number as an equivalent fraction with the same denominator as the fraction.

Example: $7\frac{1}{5} = 7 + \frac{1}{5} = \frac{35}{5} + \frac{1}{5} = \frac{36}{5}$.

Students use this method to add mixed numbers with like denominators. Converting a mixed number to a fraction should not be viewed as a separate technique to be learned by rote, but simply as a case of fraction addition.

(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 6-7)

A cake recipe calls for you to use $\frac{3}{4}$ cup of milk, $\frac{1}{4}$ cup of oil, and $\frac{2}{4}$ cup of water. How much liquid was needed to make the cake?



FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S)	What is a unit fraction? How can I apply my understanding of operations (+, -, /, *) on whole numbers to build fractions
MATHEMATICAL PRACTICE(S)	4.MP.1. Make sense of problems and persevere in solving them. 4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure. 4.MP.8. Look for and express regularity in repeated reasoning.
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4

SUBSTANDARD DECONSTRUCTION	4.NF.3a Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Understand accumulating unit fractions ($1/b$) results in a fraction (a/b), where a is greater than 1.	Using fraction models, reason that addition of fractions is joining parts that are referring to the same whole. Using fraction models, reason that subtraction of fractions is separating parts that are referring to the same whole.	

SUBSTANDARD DECONSTRUCTION	4.NF.3b Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: $3/8 = 1/8 + 1/8 + 1/8$; $3/8 = 1/8 + 2/8$; $2 \frac{1}{8} = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$.		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Recognize multiple representations of one whole using fractions with the same denominator. Add and subtract fractions with like denominators.	Using visual fraction models, decompose a fraction into the sum of fractions with the same denominator in more than one way. Record decompositions of fractions as an equation and explain the equation using visual fraction models.	

MATHEMATICS

SUBSTANDARD DECONSTRUCTION			
4.NF.3c 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.			
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	<p>Replace mixed numbers with equivalent fractions, using visual fraction models.</p> <p>Replace improper fractions with a mixed number, using visual fraction models.</p>	<p>Add and subtract mixed numbers with like denominators by using properties of operations and the relationship between addition and subtraction.</p> <p>Add and subtract mixed numbers by replacing each mixed number with an equivalent fraction.</p>	

SUBSTANDARD DECONSTRUCTION			
4.NF.3d 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.			
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:		<p>Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, by using visual fraction models and equations to represent the problem.</p>	

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

EXPLANATIONS AND EXAMPLES

A fraction with a numerator of one is called a unit fraction. When students investigate fractions other than unit fractions, such as $\frac{2}{3}$, they should be able to decompose the non-unit fraction into a combination of several unit fractions.

Example: $\frac{2}{3} = \frac{1}{3} + \frac{1}{3}$

Being able to visualize this decomposition into unit fractions helps students when adding or subtracting fractions. Students need multiple opportunities to work with mixed numbers and be able to decompose them in more than one way. Students may use visual models to help develop this understanding.

Example:

• $1\frac{1}{4} - \frac{3}{4} = \square$

$$\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$$

$$\frac{5}{4} - \frac{3}{4} = \frac{2}{4} \text{ or } \frac{1}{2}$$

Example of word problem:

- Mary and Lacey decide to share a pizza. Mary ate $\frac{3}{6}$ and Lacey ate $\frac{2}{6}$ of the pizza. How much of the pizza did the girls eat together?

Solution: The amount of pizza Mary ate can be thought of a $\frac{3}{6}$ or $\frac{1}{6}$ and $\frac{1}{6}$ and $\frac{1}{6}$. The amount of pizza Lacey ate can be thought of a $\frac{1}{6}$ and $\frac{1}{6}$. The total amount of pizza they ate is $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$ or $\frac{5}{6}$ of the whole pizza.

A separate algorithm for mixed numbers in addition and subtraction is not necessary. Students will tend to add or subtract the whole numbers first and then work with the fractions using the same strategies they have applied to problems that contained only fractions.

Example:

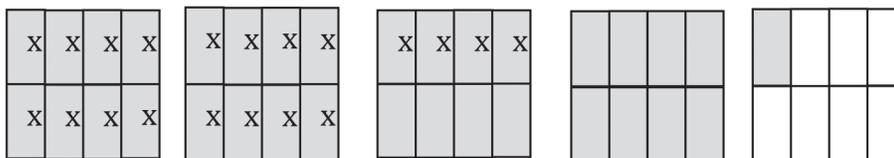
- Susan and Maria need $8\frac{3}{8}$ feet of ribbon to package gift baskets. Susan has $3\frac{1}{8}$ feet of ribbon and Maria has $5\frac{3}{8}$ feet of ribbon. How much ribbon do they have altogether? Will it be enough to complete the project? Explain why or why not.

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

Example:

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

Solution: Trevor had $4\frac{1}{8}$ pizzas to start. This is $\frac{33}{8}$ of a pizza. The x's show the pizza he has left which is $2\frac{4}{8}$ pizzas or $\frac{20}{8}$ pizzas. The shaded rectangles without the x's are the pizza he gave to his friend which is $\frac{13}{8}$ or $1\frac{5}{8}$ pizzas.



STANDARD AND DECONSTRUCTION

4.NF.4

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

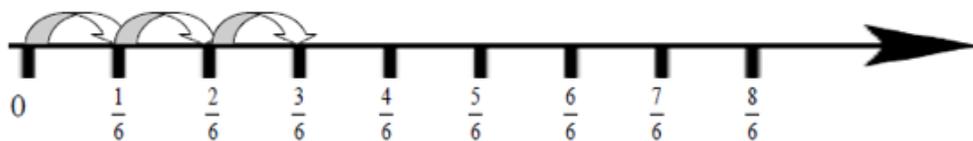
DESCRIPTION

This standard builds on students' work of adding fractions and extending that work into multiplication.

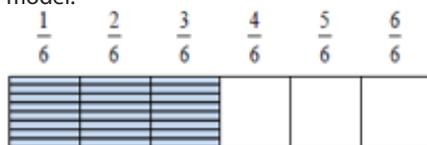
Example:

$$3/6 = 1/6 + 1/6 + 1/6 = 3 \times (1/6)$$

Number line:



Area model:



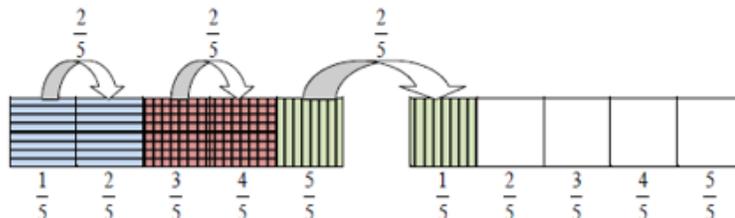
Students should see a fraction as the numerator times the unit fraction with the same denominator.

Example:

$$\frac{7}{5} = 7 \times \frac{1}{5}, \quad \frac{11}{3} = 11 \times \frac{1}{3}.$$

(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 8)

This standard extended the idea of multiplication as repeated addition. For example, $3 \times (2/5) = 2/5 + 2/5 + 2/5 = 6/5 = 6 \times (1/5)$. Students are expected to use and create visual fraction models to multiply a whole number by a fraction.



The same thinking, based on the analogy between fractions and whole numbers, allows students to give meaning to the product of whole number and a fraction.

Example:

$$3 \times \frac{2}{5} \text{ as } \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{3 \times 2}{5} = \frac{6}{5}.$$

(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 8)

When introducing this standard make sure student use visual fraction models to solve word problems related to multiplying a whole number by a fraction.

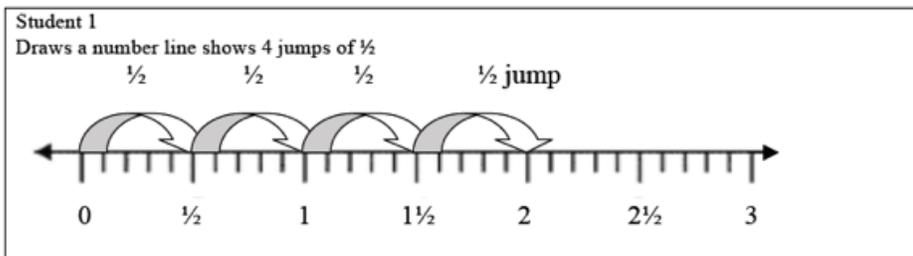
FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

DESCRIPTION (continued)

Example:

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



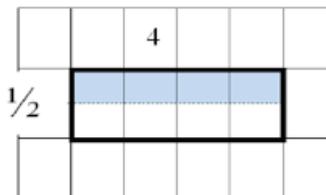
Student 2

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



Student 3

Draws an area model representing $4 \times \frac{1}{2}$ on a grid, dividing one row into $\frac{1}{2}$ to represent the multiplier



Example:

Heather bought 12 plums and ate $\frac{1}{3}$ of them. Paul bought 12 plums and ate $\frac{1}{4}$ of them. Which statement is true?

Draw a model to explain your answer.

- Heather and Paul ate the same number of plums.
- Heather ate 4 plums and Paul ate 3 plums.
- Heather ate 3 plums and Paul ate 4 plums.
- Heather had 9 plums remaining.

Students solve word problems involving multiplication of a fraction by a whole number.

Example:

If a bucket holds $2\frac{3}{4}$ gallons and 43 buckets of water fill a tank, how much does the tank hold?

The solution $43 \times 2\frac{3}{4}$ gallons, one possible way to solve problem:

$$43 \times \left(2 + \frac{3}{4}\right) = 43 \times \frac{11}{4} = \frac{473}{4} = 118\frac{1}{4} \text{ gallons}$$

(Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 8)

MATHEMATICS

ESSENTIAL QUESTION(S) FOR THE STANDARD	What is a unit fraction? How can I apply my understanding of operations (+, -, /,*) on whole numbers to build fractions?
MATHEMATICAL PRACTICE(S)	<p>4.MP.1. Make sense of problems and persevere in solving them.</p> <p>4.MP.2. Reason abstractly and quantitatively.</p> <p>4.MP.4. Model with mathematics.</p> <p>4.MP.5. Use appropriate tools strategically.</p> <p>4.MP.6. Attend to precision.</p> <p>4.MP.7. Look for and make use of structure.</p> <p>4.MP.8. Look for and express regularity in repeated reasoning.</p>
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4

SUBSTANDARD DECONSTRUCTION	4.NF.4a Understand a fraction a/b as a multiple of $1/b$. For example, use a visual fraction model to represent $5/4$ as the product $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$.		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Represent a fraction a/b as a multiple of $1/b$ (unit fractions).	Apply multiplication of whole numbers to multiplication of a fraction by a whole number using visual fraction models.	

SUBSTANDARD DECONSTRUCTION	4.NF.4b Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a)/b$.)		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	<p>Explain that a multiple of a/b is a multiple of $1/b$ (unit fraction) using a visual fraction model.</p> <p>Multiply a fraction by a whole number by using the idea that a/b is a multiple of $1/b$.</p>		

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

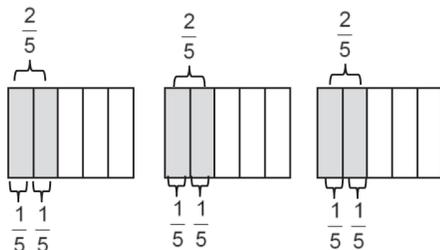
<p>SUBSTANDARD DECONSTRUCTION</p>	<p>4.NF.4c Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Multiply a fraction by a whole number. Use fraction models and equations to represent the problem.</p>	<p>Solve word problems involving multiplication of a fraction by a whole number</p>	

EXPLANATIONS AND EXAMPLES

Students need many opportunities to work with problems in context to understand the connections between models and corresponding equations. Contexts involving a whole number times a fraction lend themselves to modeling and examining patterns.

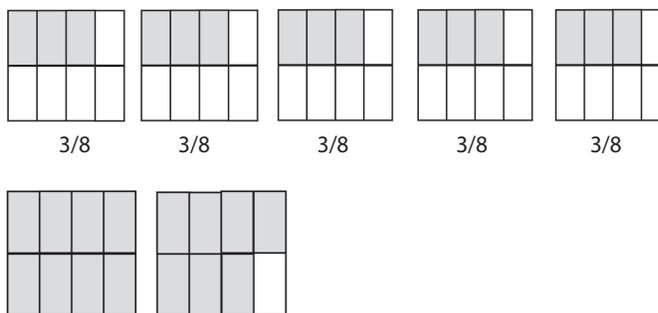
Examples:

• $3 \times (2/5) = 6 \times (1/5) = 6/5$



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

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



$\frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} = \frac{15}{8} = 1 \frac{7}{8}$

MATHEMATICS

CLUSTER: 3. Understand decimal notation for fractions, and compare decimal fractions.

BIG IDEA: How do I know when fractions are equivalent?

ACADEMIC VOCABULARY: fraction, numerator, denominator, equivalent, reasoning, decimals, tenths, hundredths, multiplication, comparisons/compare, <, >, =

STANDARD AND DECONSTRUCTION

4.NF.5

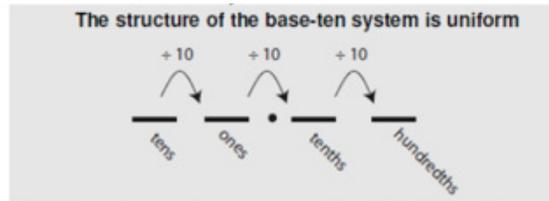
Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express $3/10$ as $30/100$ and add $3/10 + 4/100 = 34/100$.

DESCRIPTION

This standard continues the work of equivalent fractions by having students change fractions with a 10 in the denominator into equivalent fractions that have a 100 in the denominator. In order to prepare for work with decimals (4.NF.6 and 4.NF.7), experiences that allow students to shade decimal grids (10x10 grids) can support this work. Student experiences should focus on working with grids rather than algorithms.

Students can also use base ten blocks and other place value models to explore the relationship between fractions with denominators of 10 and denominators of 100.

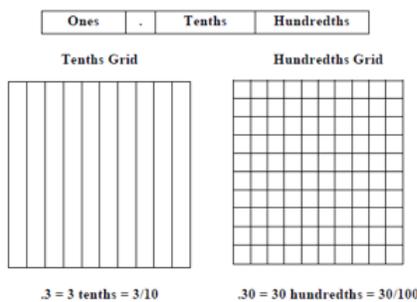
Students in fourth grade work with fractions having denominators 10 and 100. Because it involves partitioning into 10 equal parts and treating the parts as numbers called one tenth and one hundredth, work with these fractions can be used as preparation to extend the base-ten system to non-whole numbers.



(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 12)

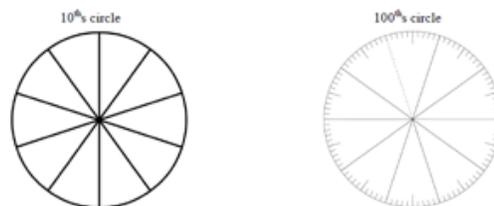
This work in fourth grade lays the foundation for performing operations with decimal numbers in fifth grade.

Example:



Example:

Represent 3 tenths and 30 hundredths on the models below.



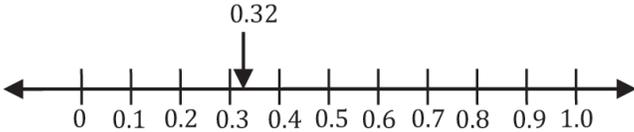
FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S) FOR THE STANDARD	How do I know when fractions are equivalent?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Rename and recognize a fraction with a denominator of 10 as a fraction with a denominator of 100 Recognize that two fractions with unlike denominators can be equivalent	Use knowledge of renaming tenths to hundredths to add two fractions with denominators 10 and 100	
EXPLANATIONS AND EXAMPLES	Students can use base ten blocks, graph paper, and other place value models to explore the relationship between fractions with denominators of 10 and denominators of 100. Students may represent $\frac{3}{10}$ with 3 longs and may also write the fraction as $\frac{30}{100}$ with the whole in this case being the flat (the flat represents one hundred units with each unit equal to one hundredth). Students begin to make connections to the place value chart as shown in 4.NF.6. This work in fourth grade lays the foundation for performing operations with decimal numbers in fifth grade.		

MATHEMATICS

STANDARD AND DECONSTRUCTION

4.NF.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.														
DESCRIPTION	Decimals are introduced for the first time. Students should have ample opportunities to explore and reason about the idea that a number can be represented as both a fraction and a decimal.														
ESSENTIAL QUESTION(S) FOR THE STANDARD	How are fractions and decimals related?														
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.														
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4														
Instructional Targets	Know: Concepts/Skills	Think	Do												
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application												
Students should be able to:	Explain the values of digits in the decimal places. Read and write decimals through hundredths. Rename fractions with 10 and 100 in the denominator as decimals. Recognize multiple representations of fractions with denominators 10 or 100.	Represent fractions with denominators 10 or 100 with multiple representations and decimal notation. Explain how decimals and fractions relate.													
EXPLANATIONS AND EXAMPLES	Students make connections between fractions with denominators of 10 and 100 and the place value chart. By reading fraction names, students say $\frac{32}{100}$ as thirty-two hundredths and rewrite this as 0.32 or represent it on a place value model as shown below. <table border="1" data-bbox="462 1497 1291 1570" style="margin: 10px auto;"> <tr> <td>Hundreds</td> <td>Tens</td> <td>Ones</td> <td>•</td> <td>Tenths</td> <td>Hundredths</td> </tr> <tr> <td></td> <td></td> <td></td> <td>•</td> <td>3</td> <td>2</td> </tr> </table> Students use the representations explored in 4.NF.5 to understand $\frac{32}{100}$ can be expanded to $\frac{3}{10}$ and $\frac{2}{100}$. Students represent values such as 0.32 or $\frac{32}{100}$ on a number line. $\frac{32}{100}$ is more than $\frac{30}{100}$ (or $\frac{3}{10}$) and less than $\frac{40}{100}$ (or $\frac{4}{10}$). It is closer to $\frac{30}{100}$ so it would be placed on the number line near that value. <div style="text-align: center; margin-top: 10px;">  </div>			Hundreds	Tens	Ones	•	Tenths	Hundredths				•	3	2
Hundreds	Tens	Ones	•	Tenths	Hundredths										
			•	3	2										

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

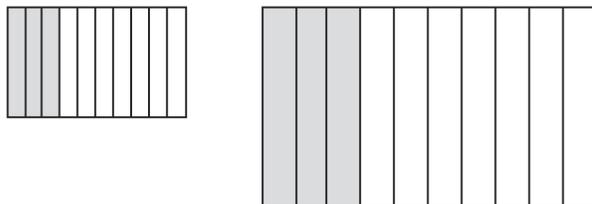
<p>4.NF.7</p>	<p>Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual model.</p>
<p>DESCRIPTION</p>	<p>Students should reason that comparisons are only valid when they refer to the same whole. Visual models include area models, decimal grids, decimal circles, number lines, and meter sticks.</p> <p>The decimal point is used to signify the location of the ones place, but its location may suggest there should be a “oneths” place to its right in order to create symmetry with respect to the decimal point. However, because one is the basic unit from which the other base ten units are derived, the symmetry occurs instead with respect to the ones place.</p> <p>Ways of reading decimals aloud vary. Mathematicians and scientists often read 0.15 aloud as “zero point one five” or “point one five.” (Decimals smaller than one may be written with or without a zero before the decimal point.) Decimals with many non-zero digits are more easily read aloud in this manner. (For example, the number π, which has infinitely many non-zero digits, begins 3.1415)</p> <p>Other ways to read 0.15 aloud are “1 tenth and 5 hundredths” and “15 hundredths,” just as 1,500 is sometimes read “15 hundred” or “1 thousand, 5 hundred.” Similarly, 150 is read “one hundred and fifty” or “a hundred fifty” and understood as 15 tens, as 10 tens and 5 tens, and as $100 + 50$.</p> <p>Just as 15 is understood as 15 ones and as 1 ten and 5 ones in computations with whole numbers, 0.15 is viewed as 15 hundredths and as 1 tenth and 5 hundredths in computations with decimals.</p> <p>It takes time to develop understanding and fluency with the different forms. Layered cards for decimals can help students become fluent with decimal equivalencies such as three tenths is thirty hundredths.</p> <div data-bbox="667 1056 1258 1245" data-label="Diagram"> <p>The diagram shows a horizontal number line with five tick marks labeled from left to right: 'hundred', 'ten', '1', 'tenth', and 'hundredth'. A central tick mark is labeled '1'. Two curved arrows originate from the '1' mark and point to the 'hundred' and 'hundredth' marks, illustrating symmetry with respect to the ones place.</p> </div> <p><i>(Progressions for the CCSSM; Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 12-13)</i></p>
<p>ESSENTIAL QUESTION(S) FOR THE STANDARD</p>	<p>How do you compare decimals?</p>
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.</p>
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4</p>

MATHEMATICS

Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Recognize that comparisons are valid only when the two decimals refer to the same whole.	<p>Compare two decimals to hundredths by reasoning about their size.</p> <p>Record the results of comparisons with the symbols $>$, $=$, or $<$.</p> <p>Justify the conclusions using visual models and other methods.</p>	

EXPLANATIONS AND EXAMPLES

Students build area and other models to compare decimals. Through these experiences and their work with fraction models, they build the understanding that comparisons between decimals or fractions are only valid when the whole is the same for both cases. Each of the models below shows $\frac{3}{10}$ but the whole on the right is much bigger than the whole on the left. They are both $\frac{3}{10}$ but the model on the right is a much larger quantity than the model on the left.



When the wholes are the same, the decimals or fractions can be compared.

Example:

- Draw a model to show that $0.3 < 0.5$. (Students would sketch two models of approximately the same size to show the area that represents three-tenths is smaller than the area that represents five-tenths.)



FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

4.NF.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.														
DESCRIPTION	Decimals are introduced for the first time. Students should have ample opportunities to explore and reason about the idea that a number can be represented as both a fraction and a decimal.														
ESSENTIAL QUESTION(S) FOR THE STANDARD	How are fractions and decimals related?														
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.7. Look for and make use of structure.														
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4														
Instructional Targets	Know: Concepts/Skills	Think	Do												
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application												
Students should be able to:	Explain the values of digits in the decimal places Read and write decimals through hundredths Rename fractions with 10 and 100 in the denominator as decimals Recognize multiple representations of fractions with denominators 10 or 100	Represent fractions with denominators 10 or 100 with multiple representations and decimal notation Explain how decimals and fractions relate													
EXPLANATIONS AND EXAMPLES	<p>Students make connections between fractions with denominators of 10 and 100 and the place value chart. By reading fraction names, students say $\frac{32}{100}$ as thirty-two hundredths and rewrite this as 0.32 or represent it on a place value model as shown below.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">Hundreds</td> <td style="padding: 5px;">Tens</td> <td style="padding: 5px;">Ones</td> <td style="padding: 5px;">•</td> <td style="padding: 5px;">Tenths</td> <td style="padding: 5px;">Hundredths</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;">•</td> <td style="padding: 5px; text-align: center;">3</td> <td style="padding: 5px; text-align: center;">2</td> </tr> </table> <p>Students use the representations explored in 4.NF.5 to understand $\frac{32}{100}$ can be expanded to $\frac{3}{10}$ and $\frac{2}{100}$.</p> <p>Students represent values such as 0.32 or $\frac{32}{100}$ on a number line. $\frac{32}{100}$ is more than $\frac{30}{100}$ (or $\frac{3}{10}$) and less than $\frac{40}{100}$ (or $\frac{4}{10}$). It is closer to $\frac{30}{100}$ so it would be placed on the number line near that value.</p> <div style="text-align: center;"> <p>0.32</p> </div>			Hundreds	Tens	Ones	•	Tenths	Hundredths				•	3	2
Hundreds	Tens	Ones	•	Tenths	Hundredths										
			•	3	2										

DOMAIN:

**MEASUREMENT AND
DATA (MD)**

FOURTH GRADE

MATHEMATICS



MATHEMATICS

DOMAIN

Measurement and Data

CLUSTERS

1. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
2. Represent and interpret data.
3. Geometric measurement: understand concepts of angle and measure angles.

MEASUREMENT AND DATA (MD)

THIRD	FOURTH	FIFTH
Time and Money		
Section 1: Time	Section 1: Time	Section 1: Time
MD.1 Read and write time to nearest minute and calculate time intervals.		
Length, Area, and Volume		
Area and Perimeter	Area and Perimeter	Area and Perimeter
3.MD.5.b A plane figure that can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.	4.MD.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.	5.MD.3.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.5.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.		5.MD.3.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.
3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft., and improvised units).		5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
3.MD.7.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.		5.MD.5.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.MD.7.b Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.		5.MD.5.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.
3.MD.7.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.		5.MD.5.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.
3.MD.7.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.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.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. (Excludes compound units such as cm^3 and finding the geometric volume of a container.)		

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

MEASUREMENT AND DATA (MD)

THIRD	FOURTH	FIFTH
Section 5: Conversion	Section 5: Conversion	Section 5: Conversion
	4.MD.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.	5.MD.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.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.	
Early Data and Monitoring		
Modeling with Data	Modeling with Data	Modeling with Data
3.MD.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.	4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots.
3.MD.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.		

Source: turnonccmath.net, NC State University College of Education

MATHEMATICS

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

BIG IDEA: Real world problems are solved using the four operations, formulas, plots and units of measurement. Units of measurement quantify and represent daily tasks (distance, time, volume, mass, money).

ACADEMIC VOCABULARY:

Measure, metric, customary, convert/conversion, relative size, liquid volume, mass, length, distance, kilometer (km), meter (m), centimeter (cm), millimeter (mm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in), foot (ft), yard (yd), mile (mi), ounce (oz), pound (lb), cup (c), pint (pt), quart (qt), gallon (gal), time, hour, minute, second, equivalent, operations, add, subtract, multiply, divide, fractions, decimals, area, perimeter

STANDARD AND DECONSTRUCTION

4.MD.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 2-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), ...

DESCRIPTION

The units of measure that have not been addressed in prior years are cups, pints, quarts, gallons, pounds, ounces, kilometers, millimeter, milliliters, and seconds. Students' prior experiences were limited to measuring length, mass (metric and customary systems), liquid volume (metric only), and elapsed time. Students did not convert measurements.

Students develop benchmarks and mental images about a meter (e.g., about the height of a tall chair) and a kilometer (e.g., the length of 10 football fields including the end zones, or the distance a person might walk in about 12 minutes), and they also understand that "kilo" means a thousand, so 3000 m is equivalent to 3 km. Expressing larger measurements in smaller units within the metric system is an opportunity to reinforce notions of place value. There are prefixes for multiples of the basic unit (meter or gram), although only a few (kilo-, centi-, and milli-) are in common use. Tables such as the one below are an opportunity to develop or reinforce place value concepts and skills in measurement activities. Relating units within the metric system is another opportunity to think about place value. For example, students might make a table that shows measurements of the same lengths in centimeters and meters. Relating units within the traditional system provides an opportunity to engage in mathematical practices, especially "look for and make use of structure" and "look for and express regularity in repeated reasoning" For example, students might make a table that shows measurements of the same lengths in feet and inches.

(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 20)

Super- or subordinate unit	Length in terms of basic unit
kilometer	10^3 or 1000 meters
hectometer	10^2 or 100 meters
decameter	10^1 or 10 meters
meter	1 meter
decimeter	10^{-1} or $\frac{1}{10}$ meters
centimeter	10^{-2} or $\frac{1}{100}$ meters
millimeter	10^{-3} or $\frac{1}{1000}$ meters

Note the similarity to the structure of base-ten units and U.S. currency (see illustrations on p. 12 of the Number and Operations in Base Ten Progression).

Centimeter and meter equivalences

cm	m
100	1
200	2
300	3
500	
1000	

Foot and inch equivalences

feet	inches
0	0
1	12
2	24
3	

(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 20)

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

DESCRIPTION (continued)

Students need ample opportunities to become familiar with these new units of measure and explore the patterns and relationships in the conversion tables that they create.

Students may use a two-column chart to convert from larger to smaller units and record equivalent measurements. They make statements such as, if one foot is 12 inches, then 3 feet has to be 36 inches because there are 3 groups of 12.

Example:

Customary length conversion table

Yards	Feet
1	3
2	6
3	9
<i>n</i>	<i>n</i> x 3

Foundational understandings to help with measure concepts:

Understand that larger units can be subdivided into equivalent units (partition).

Understand that the same unit can be repeated to determine the measure (iteration).

Understand the relationship between the size of a unit and the number of units needed (compensatory principal).

These Standards do not differentiate between weight and mass. Technically, mass is the amount of matter in an object. Weight is the force exerted on the body by gravity. On the earth's surface, the distinction is not important (on the moon, an object would have the same mass, would weigh less due to the lower gravity).

(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 2)

ESSENTIAL QUESTION(S) FOR THE STANDARD

What is the relationship of units for the SI and metric systems?

MATHEMATICAL PRACTICE(S)

- 4.MP.2. Reason abstractly and quantitatively.
- 4.MP.5. Use appropriate tools strategically.
- 4.MP.6. Attend to precision.

DOK Range Target for Instruction & Assessment

1 2 3 4

Instructional Targets

Know: Concepts/Skills

Think

Do

Assessment Types

Tasks assessing concepts, skills, and procedures

Tasks assessing expressing mathematical reasoning

Tasks assessing modeling/application

Students should be able to:

Know relative size of measurement units (km, m; kg, g; lb, oz; L, mL; hrs, min, sec).

Compare the different units within the same system of measurement.
Convert larger units of measurement within the same system to smaller units and record conversions in a 2-column table.

EXPLANATIONS AND EXAMPLES

The units of measure that have not been addressed in prior years are pounds, ounces, kilometers, milliliters, and seconds. Students' prior experiences were limited to measuring length, mass, liquid volume, and elapsed time. Students did not convert measurements. Students need ample opportunities to become familiar with these new units of measure.

Students may use a two-column chart to convert from larger to smaller units and record equivalent measurements. They make statements such as, if one foot is 12 inches, then 3 feet has to be 36 inches because there are 3 groups of 12.

Example:

kg	g
1	1000
2	2000
3	3000

ft	in
1	12
2	24
3	36

lb	oz
1	16
2	32
3	48

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

4.MD.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.

DESCRIPTION

This standard includes multi-step word problems related to expressing measurements from a larger unit in terms of a smaller unit (e.g., feet to inches, meters to centimeter, and dollars to cents). Students should have ample opportunities to use number line diagrams to solve word problems.

Example:

Charlie and 10 friends are planning for a pizza party. They purchased 3 quarts of milk. If each glass holds 8oz will everyone get at least one glass of milk?

Possible solution: Charlie plus 10 friends = 11 total people

11 people x 8 ounces (glass of milk) = 88 total ounces

1 quart = 2 pints = 4 cups = 32 ounces

Therefore 1 quart = 2 pints = 4 cups = 32 ounces

2 quarts = 4 pints = 8 cups = 64 ounces

3 quarts = 6 pints = 12 cups = 96 ounces

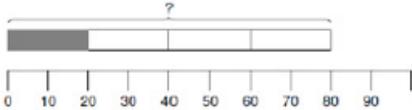
If Charlie purchased 3 quarts (6 pints) of milk there would be enough for everyone at his party to have at least one glass of milk. If each person drank 1 glass then he would have 1- 8 oz glass or 1 cup of milk left over.

Number line diagrams that feature a measurement scale can represent measurement quantities. Examples include: ruler, diagram marking off distance along a road with cities at various points, a timetable showing hours throughout the day, or a volume measure on the side of a container.

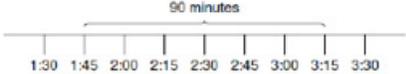
Example:

Using number line diagrams to solve word problems

Juan spent $\frac{1}{4}$ of his money on a game. The game cost \$20. How much money did he have at first?



What time does Maria have to leave to be at her friend's house by a quarter after 3 if the trip takes 90 minutes?



Using a number line diagram to represent time is easier if students think of digital clocks rather than round clocks. In the latter case, placing the numbers on the number line involves considering movements of the hour and minute hands.

MATHEMATICS

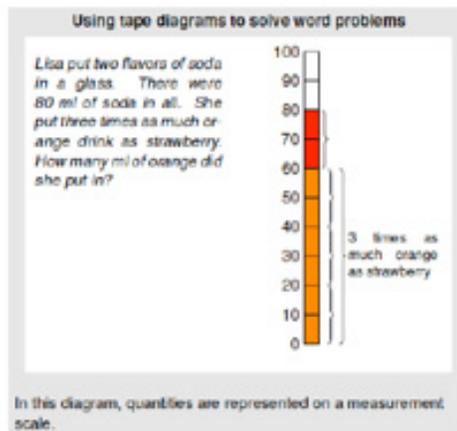
DESCRIPTION (continued)

Students also combine competencies from different domains as they solve measurement problems using all four arithmetic operations, addition, subtraction, multiplication, and division.

Example: "How many liters of juice does the class need to have at least 35 cups if each cup takes 225 ml?"

Students may use tape or number line diagrams for solving such problems.

Example:



(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 20)

Example:

At 7:00 a.m. Candace wakes up to go to school. It takes her 8 minutes to shower, 9 minutes to get dressed and 17 minutes to eat breakfast. How many minutes does she have until the bus comes at 8:00 a.m.? Use the number line to help solve the problem.



ESSENTIAL QUESTION(S) FOR THE STANDARD

How do I apply my understanding of operations and conversion of measurements to solve word problems?

MATHEMATICAL PRACTICE(S)

- 4.MP.1. Make sense of problems and persevere in solving them.
- 4.MP.2. Reason abstractly and quantitatively.
- 4.MP.4. Model with mathematics.
- 4.MP.5. Use appropriate tools strategically.
- 4.MP.6. Attend to precision.

DOK Range Target for Instruction & Assessment

1 2 3 4

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Express measurements given in a larger unit in terms of a smaller unit Add, subtract, multiply, and divide fractions and decimals.	Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. Solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money. Solve word problems involving measurement that include simple fractions or decimals. Solve word problems that require expressing measurements given in a larger unit in terms of a smaller unit.	
EXPLANATIONS AND EXAMPLES	<p><u>Division/fractions:</u> Susan has 2 feet of ribbon. She wants to give her ribbon to her 3 best friends so each friend gets the same amount. How much ribbon will each friend get?</p> <p>Students may record their solutions using fractions or inches. (The answer would be $\frac{2}{3}$ of a foot or 8 inches. Students are able to express the answer in inches because they understand that $\frac{1}{3}$ of a foot is 4 inches and $\frac{2}{3}$ of a foot is 2 groups of $\frac{1}{3}$.)</p> <p><u>Addition:</u> Mason ran for an hour and 15 minutes on Monday, 25 minutes on Tuesday, and 40 minutes on Wednesday. What was the total number of minutes Mason ran?</p> <p><u>Subtraction:</u> A pound of apples costs \$1.20. Rachel bought a pound and a half of apples. If she gave the clerk a \$5.00 bill, how much change will she get back?</p> <p><u>Multiplication:</u> Mario and his 2 brothers are selling lemonade. Mario brought one and a half liters, Javier brought 2 liters, and Ernesto brought 450 milliliters. How many total milliliters of lemonade did the boys have?</p> <p>Number line diagrams that feature a measurement scale can represent measurement quantities. Examples include: ruler, diagram marking off distance along a road with cities at various points, a timetable showing hours throughout the day, or a volume measure on the side of a container.</p>		

STANDARD AND DECONSTRUCTION

4.MD.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.

DESCRIPTION

Based on work in third grade students learn to consider perimeter and area of rectangles. Fourth graders multiplication, spatially structuring arrays, and area, they abstract the formula for the area of a rectangle $A = l \times w$.

- The formula is a generalization of the understanding, that, given a unit of length, a rectangle whose sides have length w units and l units, can be partitioned into w rows of unit squares with l squares in each row. The product $l \times w$ gives the number of unit squares in the partition, thus the area measurement is $l \times w$ square units. These square units are derived from the length unit.

Students generate and discuss advantages and disadvantages of various formulas for the perimeter length of a rectangle that is l units by w units.

- For example, $P = 2l + 2w$ has two multiplications and one addition, but $P = 2(l + w)$, which has one addition and one multiplication, involves fewer calculations. The latter formula is also useful when generating all possible rectangles with a given perimeter. The length and width vary across all possible pairs whose sum is half of the perimeter (e.g., for a perimeter of 20, the length and width are all of the pairs of numbers with sum 10).

Giving verbal summaries of these formulas is also helpful. For example, a verbal summary of the basic formula, $A = l + w + l + w$, is “add the lengths of all four sides.” Specific numerical instances of other formulas or mental calculations for the perimeter of a rectangle can be seen as examples of the properties of operations, e.g., $2l + 2w = 2(l + w)$ illustrates the distributive property.

Perimeter problems often give only one length and one width, thus remembering the basic formula can help to prevent the usual error of only adding one length and one width. The formula $P = 2(l + w)$ emphasizes the step of multiplying the total of the given lengths by 2. Students can make a transition from showing all length units along the sides of a rectangle or all area units within by drawing a rectangle showing just parts of these as a reminder of which kind of unit is being used. Writing all of the lengths around a rectangle can also be useful. Discussions of formulas such as $P = 2l + 2w$, can note that unlike area formulas, perimeter formulas combine length measurements to yield a length measurement.

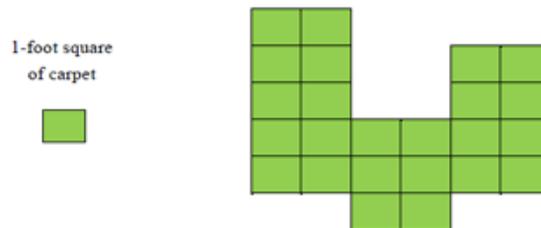
Such abstraction and use of formulas underscores the importance of distinguishing between area and perimeter in

Grade 3 and maintaining the distinction in Grade 4 and later grades, where rectangle perimeter and area problems may get more complex and problem solving can benefit from knowing or being able to rapidly remind oneself of how to find an area or perimeter. By repeatedly reasoning about how to calculate areas and perimeters of rectangles, students can come to see area and perimeter formulas as summaries of all such calculations.

(*Progressions for the CCSSM, Geometric Measurement*, CCSS Writing Team, June 2012, page 21)

Example:

Mr. Rutherford is covering the miniature golf course with an artificial grass. How many 1-foot squares of carpet will he need to cover the entire course?



FOURTH GRADE

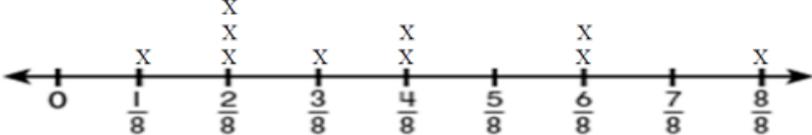
LEXILE GRADE LEVEL BAND: 740L TO 940L

<p>DESCRIPTION (continued)</p>	<p>Students learn to apply these understandings and formulas to the solution of real-world and mathematical problems.</p> <p>Example: A rectangular garden has as an area of 80 square feet. It is 5 feet wide. How long is the garden?</p> <p>Here, specifying the area and the width creates an unknown factor problem. Similarly, students could solve perimeter problems that give the perimeter and the length of one side and ask the length of the adjacent side.</p> <p>Students should be challenged to solve multistep problems.</p> <p>Example: A plan for a house includes rectangular room with an area of 60 square meters and a perimeter of 32 meters. What are the length and the width of the room?</p> <p>In fourth grade and beyond, the mental visual images for perimeter and area from third grade can support students in problem solving with these concepts. When engaging in the mathematical practice of reasoning abstractly and quantitatively in work with area and perimeter, students think of the situation and perhaps make a drawing. Then they recreate the “formula” with specific numbers and one unknown number as a situation equation for this particular numerical situation. “Apply the formula” does not mean write down a memorized formula and put in known values because in fourth grade students do not evaluate expressions (they begin this type of work in Grade 6).</p> <p>In fourth grade, working with perimeter and area of rectangles is still grounded in specific visualizations and numbers. These numbers can now be any of the numbers used in fourth grade (for addition and subtraction for perimeter and for multiplication and division for area). By repeatedly reasoning about constructing situation equations for perimeter and area involving specific numbers and an unknown number, students will build a foundation for applying area, perimeter, and other formulas by substituting specific values for the variables in later grades. (<i>Progressions for the CCSSM, Geometric Measurement</i>, CCSS Writing Team, June 2012, page 22)</p>		
<p>ESSENTIAL QUESTION(S) FOR THE STANDARD</p>	<p>Why is it important to draw or select an accurate line plot to interpret data?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.2. Reason abstractly and quantitatively.</p> <p>4.MP.4. Model with mathematics.</p> <p>4.MP.5. Use appropriate tools strategically.</p> <p>4.MP.6. Attend to precision.</p> <p>4.MP.7. Look for and make use of structure.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Add and subtract fractions.</p>	<p>Analyze and interpret a line plot to solve problems involving addition and subtraction of fractions.</p>	<p>Create a line plot to display a data set of measurements given in fractions of a unit.</p>
<p>EXPLANATIONS AND EXAMPLES</p>	<p>Example:</p> <p>Students developed understanding of area and perimeter in 3rd grade by using visual models.</p> <p>While students are expected to use formulas to calculate area and perimeter of rectangles, they need to understand and be able to communicate their understanding of why the formulas work.</p> <p>The formula for area is $l \times w$ and the answer will always be in square units.</p> <p>The formula for perimeter can be $2l + 2w$ or $2(l + w)$ and the answer will be in linear units.</p>		

MATHEMATICS

CLUSTER:	2. Represent and interpret data.
BIG IDEA:	Real world problems are solved using the four operations, formulas, plots and units of measurement. Units of measurement quantify and represent daily tasks (distance, time, volume, mass, money).
ACADEMIC VOCABULARY:	Data, line plot, length, fractions

STANDARD AND DECONSTRUCTION

4.MD.4	Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). 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.		
DESCRIPTION	<p>This standard provides a context for students to work with fractions by measuring objects to an eighth of an inch.</p> <p>Students are making a line plot of this data and then adding and subtracting fractions based on data in the line plot.</p> <p>Example:</p> <p>Students measured objects in their desk to the nearest $\frac{1}{8}$ inch. They displayed their data collected on a line plot. How many objects measured $\frac{1}{8}$ inch? $\frac{2}{8}$ inch? If you put all the objects together end to end what would be the total length of all the objects.</p> 		
ESSENTIAL QUESTION(S) FOR THE STANDARD	Why is it important to draw or select an accurate line plot to interpret data?		
MATHEMATICAL PRACTICE(S)	4.MP.2. Reason abstractly and quantitatively. 4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Add and subtract fractions.	Analyze and interpret a line plot to solve problems involving addition and subtraction of fractions.	Create a line plot to display a data set of measurements given in fractions of a unit.

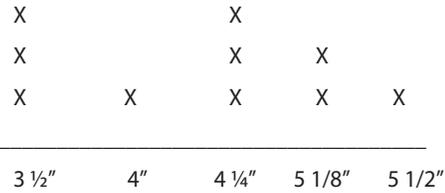
FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

EXPLANATIONS AND EXAMPLES

Example:

Ten students in Room 31 measured their pencils at the end of the day. They recorded their results on the line plot below.



Possible questions:

- What is the difference in length from the longest to the shortest pencil?
- If you were to line up all the pencils, what would the total length be?
- If the $5\frac{1}{8}$ " pencils are placed end to end, what would be their total length?

MATHEMATICS

CLUSTER: 3. Geometric measurement: understand concepts of angle and measure angles.

BIG IDEA: Angles are geometric shapes that describe patterns and reason in the physical world.

ACADEMIC VOCABULARY: Measure, point, end point, geometric shapes, ray, angle, circle, fraction, intersect, one-degree angle, protractor, decomposed, addition, subtraction, unknown

STANDARD AND DECONSTRUCTION

4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.

DESCRIPTION

This standard brings up a connection between angles and circular measurement (360 degrees).

Angle measure is a “turning point” in the study of geometry. Students often find angles and angle measure to be difficult concepts to learn, but that learning allows them to engage in interesting and important mathematics. An *angle* is the union of two rays, a and b , with the same initial point P . The rays can be made to coincide by rotating one to the other about P ; this rotation determines the size of the angle between a and b . The rays are sometimes called the *sides* of the angles.

Another way of saying this is that each ray determines a direction and the angle size measures the change from one direction to the other. Angles are measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $1/360$ of a circle is called a “one-degree angle,” and degrees are the unit used to measure angles in elementary school. A full rotation is thus 360°

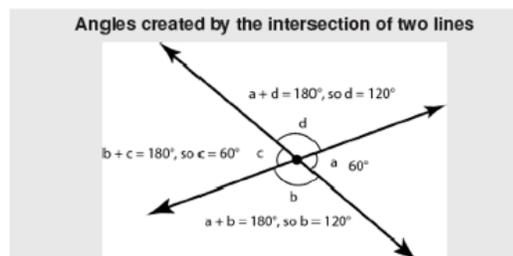
Two angles are called *complementary* if their measurements have the sum of 90° . Two angles are called *supplementary* if their measurements have the sum of 180° . Two angles with the same vertex that overlap only at a boundary (i.e., share a side) are called *adjacent angles*. These terms may come up in classroom discussion, they will not be tested. This concept is developed thoroughly in middle school (7th grade).

Like length, area, and volume, angle measure is additive: The sum of the measurements of *adjacent angles* is the measurement of the angle formed by their union. This leads to other important properties. If a right angle is decomposed into two adjacent angles, the sum is 90° , thus they are complementary. Two adjacent angles that compose a “straight angle” of 180° must be supplementary.

An angle

name	measurement
right angle	90°
straight angle	180°
acute angle	between 0 and 90°
obtuse angle	between 90° and 180°
reflex angle	between 180° and 360°

(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 23)

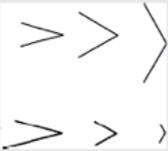


When two lines intersect, they form four angles. If the measurement of one is known (e.g., angle a is 60°), the measurement of the other three can be determined.

(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 23)

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

<p>DESCRIPTION (continued)</p>	<div data-bbox="591 243 1101 632" style="border: 1px solid gray; padding: 5px;"> <p style="text-align: center;">Two representations of three angles</p>  <p>Initially, some students may correctly compare angle sizes only if all the line segments are the same length (as shown in the top row). If the lengths of the line segments are different (as shown in the bottom row), these students base their judgments on the lengths of the segments, the distances between their endpoints, or even the area of the triangles determined by the drawn arms. They believe that the angles in the bottom row decrease in size from left to right, although they have, respectively, the same angle measurements as those in the top row.</p> </div> <p><i>(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 23)</i></p> <p>This standard calls for students to explore an angle as a series of “one-degree turns.”</p> <p>A water sprinkler rotates one-degree at each interval. If the sprinkler rotates a total of 100°, how many one-degree turns has the sprinkler made?</p>
<p>ESSENTIAL QUESTION(S) FOR THE STANDARD</p>	<p>What is an angle and how can I measure it?</p>
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure.</p>
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>

<p>SUBSTANDARD DECONSTRUCTION</p>	<p>4.MD.5a 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 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles.</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Define angle. Recognize a circle as a geometric figure that has 360 degrees. Recognize and identify an angle as a geometric shape formed from 2 rays with a common endpoint. Recognize that an angle is a fraction of a 360 degree circle.</p>		

MATHEMATICS

SUBSTANDARD DECONSTRUCTION			
4.MD.5b An angle that turns through n one-degree angles is said to have an angle measure of n degrees.			
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Explain the angle measurement in terms of degrees.		

EXPLANATIONS AND EXAMPLES

The diagram below will help students understand that an angle measurement is not related to an area since the area between the 2 rays is different for both circles yet the angle measure is the same.

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

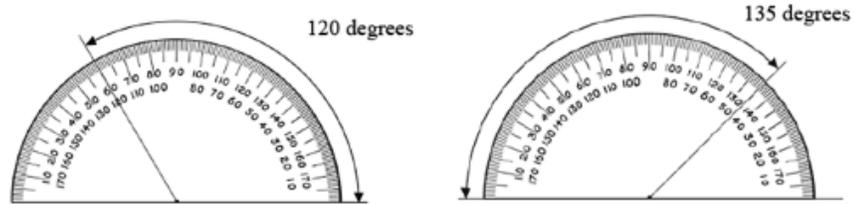
STANDARD AND DECONSTRUCTION

4.MD.6

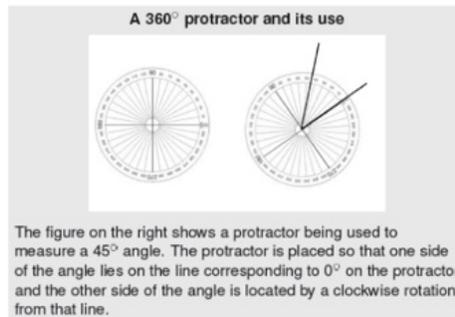
Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

DESCRIPTION

Students should measure angles and sketch angles



As with all measurable attributes, students must first recognize the attribute of angle measure, and distinguish it from other attributes. As with other concepts students need varied examples and explicit discussions to avoid learning limited ideas about measuring angles (e.g., misconceptions that a right angle is an angle that points to the right, or two right angles represented with different orientations are not equal in measure). If examples and tasks are not varied, students can develop incomplete and inaccurate notions. For example, some come to associate all slanted lines with 45° measures and horizontal and vertical lines with measures of 90° . Others believe angles can be “read off” a protractor in “standard” position, that is, a base is horizontal, even if neither ray of the angle is horizontal. Measuring and then sketching many angles with no horizontal or vertical ray perhaps initially using circular 360° protractors can help students avoid such limited conceptions. (*Progressions for the CCSSM, Geometric Measurement*, CCSS Writing Team, June 2012, page 23)



(*Progressions for the CCSSM, Geometric Measurement*, CCSS Writing Team, June 2012, page 23)

ESSENTIAL QUESTION(S) FOR THE STANDARD

How can I accurately measure an angle?

MATHEMATICAL PRACTICE(S)

- 4.MP.2. Reason abstractly and quantitatively.
- 4.MP.5. Use appropriate tools strategically.
- 4.MP.6. Attend to precision.

DOK Range Target for Instruction & Assessment

- 1 2 3 4

MATHEMATICS

Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	<p>Recognize that angles are measured in degrees ($^{\circ}$).</p> <p>Read a protractor.</p>	<p>Determine which scale on the protractor to use, based on the direction the angle is open.</p> <p>Determine the kind of angle based on the specified measure to decide reasonableness of a sketch.</p>	<p>Measure angles in whole-number degrees using a protractor</p> <p>Sketch angles of specified measure.</p>
EXPLANATIONS AND EXAMPLES	<p>Before students begin measuring angles with protractors, they need to have some experiences with benchmark angles. They transfer their understanding that a 360° rotation about a point makes a complete circle to recognize and sketch angles that measure approximately 90° and 180°. They extend this understanding and recognize and sketch angles that measure approximately 45° and 30°. They use appropriate terminology (acute, right, and obtuse) to describe angles and rays (perpendicular).</p>		

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

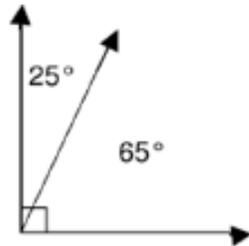
STANDARD AND DECONSTRUCTION

4.MD.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.

DESCRIPTION

This standard addresses the idea of decomposing (breaking apart) an angle into smaller parts.



Example:

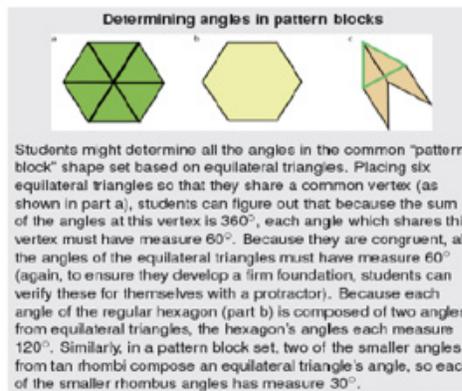
A lawn water sprinkler rotates 65 degrees and then pauses. It then rotates an additional 25 degrees. What is the total degree of the water sprinkler rotation? To cover a full 360 degrees how many times will the water sprinkler need to be moved?

If the water sprinkler rotates a total of 25 degrees then pauses. How many 25 degree cycles will it go through for the rotation to reach at least 90 degrees?

Example:

Joey knows that when a clock's hands are exactly on 12 and 1, the angle formed by the clock's hands measures 30°. What is the measure of the angle formed when a clock's hands are exactly on the 12 and 4?

Students can develop more accurate and useful angle and angle measure concepts if presented with angles in a variety of situations. They learn to find the common features of superficially different situations such as turns in navigation, slopes, bends, corners, and openings. With guidance, they learn to represent an angle in any of these contexts as two rays, even when both rays are not explicitly represented in the context; for example, the horizontal or vertical in situations that involve slope (e.g., roads or ramps), or the angle determined by looking up from the horizon to a tree or mountain-top. Eventually they abstract the common attributes of the situations as angles (which are represented with rays and a vertex,) and angle measurements.



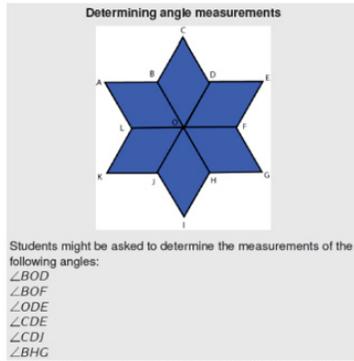
(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 24)

MATHEMATICS

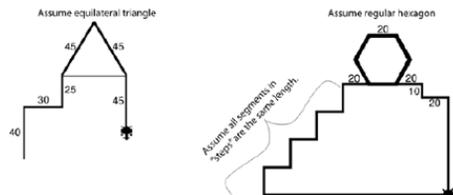
DESCRIPTION

Students with an accurate conception of angle can recognize that angle measure is additive. As with length, area, and volume, 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. Students can then solve interesting and challenging addition and subtraction problems to find the measurements of unknown angles on a diagram in real world and mathematical problems.

For example, they can find the measurements of angles formed a pair of intersecting lines, as illustrated above, or given a diagram showing the measurement of one angle, find the measurement of its complement. They can use a protractor to check, not to check their reasoning, but to ensure that they develop full understanding of the mathematics and mental images for important benchmark angles (e.g., 30° , 45° , 60° , and 90°).



(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 24)



(Progressions for the CCSSM, Geometric Measurement, CCSS Writing Team, June 2012, page 25)

ESSENTIAL QUESTION(S) FOR THE STANDARD

How can I accurately find an angle when I only know one part of the angle?

MATHEMATICAL PRACTICE(S)

- 4.MP.1. Make sense of problems and persevere in solving them.
- 4.MP.2. Reason abstractly and quantitatively.
- 4.MP.4. Model with mathematics.
- 4.MP.6. Attend to precision.

DOK Range Target for Instruction & Assessment

1 2 3 4

Instructional Targets

Know: Concepts/Skills

Think

Do

Assessment Types

Tasks assessing concepts, skills, and procedures

Tasks assessing expressing mathematical reasoning

Tasks assessing modeling/application

Students should be able to:

Recognize that an angle can be divided into smaller angles.

Solve addition and subtraction equations to find unknown angle measurements on a diagram.

Find an angle measure by adding the measurements of the smaller angles that make up the larger angle.

Find an angle measure by subtracting the measurements of the smaller angle from the larger angle.

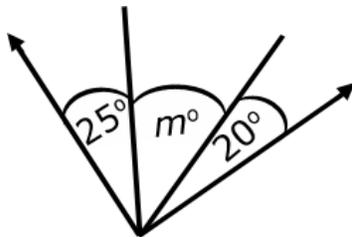
FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

EXPLANATIONS AND EXAMPLES

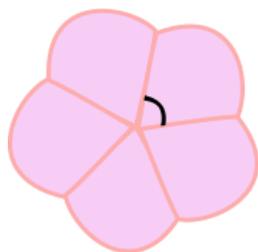
Examples

If the two rays are perpendicular, what is the value of m ?



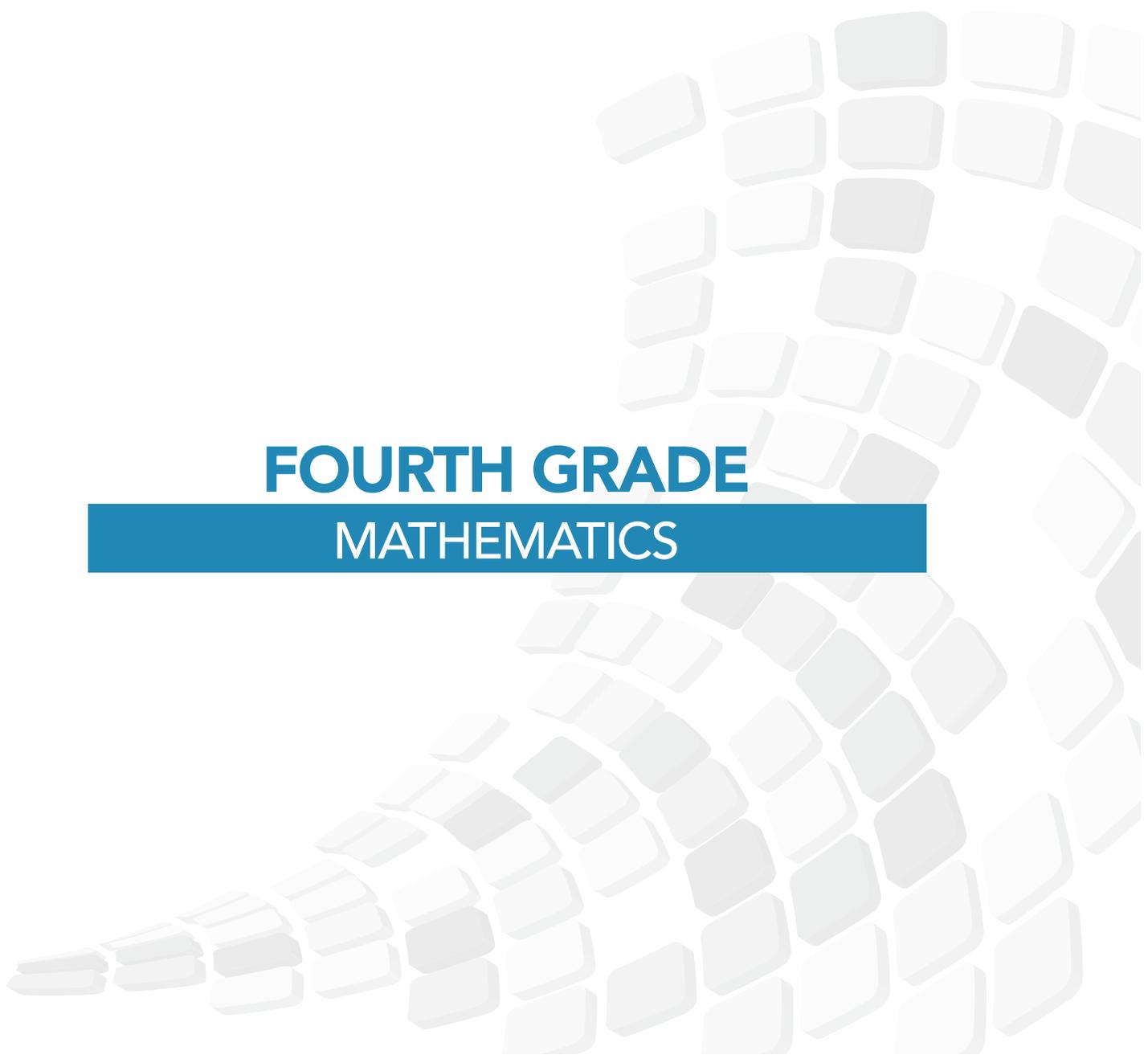
Examples:

- Joey knows that when a clock's hands are exactly on 12 and 1, the angle formed by the clock's hands measures 30° . What is the measure of the angle formed when a clock's hands are exactly on the 12 and 4?
- The five shapes in the diagram are the exact same size. Write an equation that will help you find the measure of the indicated angle. Find the angle measurement.





DOMAIN:
GEOMETRY (G)



FOURTH GRADE
MATHEMATICS

MATHEMATICS

DOMAIN Geometry (G)

CLUSTERS 1. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

GEOMETRY (G)		
THIRD	FOURTH	FIFTH
Equipartitioning		
Section 1: Equipartitioning Wholes	Section 1: Equipartitioning Wholes	Section 1: Equipartitioning Wholes
3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.		
3.NF.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 $1/b$.		
Equipartitioning Multiple Wholes	Equipartitioning Multiple Wholes	Equipartitioning Multiple Wholes
		5.NF.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.
Shapes and Angles		
Section 1: Shapes and Properties	Section 1: Shapes and Properties	Section 1: Shapes and Properties
3.G.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.	4.G.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.	5.G.4 Classify two-dimensional figures in a hierarchy based on properties.
		5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
Angles	Angles	Angles
	4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	
	4.MD.5.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 $1/360$ of a circle is called a “one-degree angle,” and can be used to measure angles.	
	MD.5.b Define an n -degree angle as n 1-degree angles	
	4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	
	4.MD.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.	

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

GEOMETRY (G)		
THIRD	FOURTH	FIFTH
Symmetry	Symmetry	Symmetry
	4.G.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.	
Early Data and Monitoring		
Modeling with Data	Modeling with Data	Modeling with Data
3.MD.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.	4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots.
3.MD.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.		
Integers, Number Lines, and Coordinate Planes		
Section 1: Integers on the Number Line	Section 1: Integers on the Number Line	Section 1: Integers on the Number Line
		5.G.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).
		5.G.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.

Source: turnoncmath.net, NC State University College of Education

MATHEMATICS

CLUSTER:	Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
DESCRIPTION:	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.
BIG IDEA:	Lines and angles form shapes that describe patterns and reason in the physical world.
ACADEMIC VOCABULARY:	Classify shapes/figures, (properties)-rules about how numbers work, point, line, line segment, ray, angle, vertex/vertices, right angle, acute, obtuse, perpendicular, parallel, right triangle, isosceles triangle, equilateral triangle, scalene triangle, line of symmetry, symmetric figures, two dimensional From previous grades: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle, cone, cylinder, sphere, kite

STANDARD AND DECONSTRUCTION

4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
DESCRIPTION	<p>This standard asks students to draw two-dimensional geometric objects and to also identify them in two-dimensional figures. This is the first time that students are exposed to rays, angles, and perpendicular and parallel lines.</p> <p>Student should be able to use side length to classify triangles as equilateral, equiangular, isosceles, or scalene; and can use angle size to classify them as acute, right, or obtuse. They then learn to cross-classify, for example, naming a shape as a right isosceles triangle. Thus, students develop explicit awareness of and vocabulary for many concepts they have been developing, including points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Such mathematical terms are useful in communicating geometric ideas, but more important is that constructing examples of these concepts, such as drawing angles and triangles that are acute, obtuse, and right, help students form richer concept images connected to verbal definitions. That is, students have more complete and accurate mental images and associated vocabulary for geometric ideas (e.g., they understand that angles can be larger than 90 and their concept images for angles include many images of such obtuse angles). Similarly, students see points and lines as abstract objects: Lines are infinite in extent and points have location but no dimension. Grids are made of points and lines and do not end at the edge of the paper.</p> <p>Students also learn to apply these concepts in varied contexts. For example, they learn to represent angles that occur in various contexts as two rays, explicitly including the reference line, e.g., a horizontal or vertical line when considering slope or a “line of sight” in turn contexts. They understand the size of the angle as a rotation of a ray on the reference line to a line depicting slope or as the “line of sight” in computer environments.</p> <p>Analyzing the shapes in order to construct them requires students to explicitly formulate their ideas about the shapes. For instance, what series of commands would produce a square? How many degrees are the angles? What is the measure of the resulting angle? What would be the commands for an equilateral triangle? How many degrees are the angles? What is the measure of the resulting angle? Such experiences help students connect what are often initially isolated ideas about the concept of angle.</p> <p>(Progressions for the CCSSM, Geometry, CCSS Writing Team, June 2012, page 14)</p> <p>Example:</p> <p>Draw two different types of quadrilaterals that have two pairs of parallel sides?</p> <p>Is it possible to have an acute right triangle? Justify your reasoning using pictures and words.</p>

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

<p>DESCRIPTION (CONTINUED)</p>	<p>Example: How many acute, obtuse and right angles are in this shape?</p>  <p>Draw and list the properties of a parallelogram. Draw and list the properties of a rectangle. How are your drawings and lists alike? How are they different? Be ready to share your thinking with the class.</p> <p>Right angle </p> <p>Acute angle </p> <p>Obtuse angle </p> <p>Straight angle </p>		
<p>ESSENTIAL QUESTION(S) FOR THE STANDARD</p>	<p>What geometric attributes can I find in a 2 dimensional shape?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.5. Use appropriate tools strategically. 4.MP.6. Attend to precision.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.</p>	<p>Analyze two-dimensional figures to identify points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.</p>	
<p>EXPLANATIONS AND EXAMPLES</p>	<p>Examples of points, line segments, lines, angles, parallelism, and perpendicularity can be seen daily. Students do not easily identify lines and rays because they are more abstract.</p> <p> segment</p> <p> line</p> <p> ray</p> <p> parallel lines</p> <p> perpendicular lines</p>		

STANDARD AND DECONSTRUCTION

4.G.2

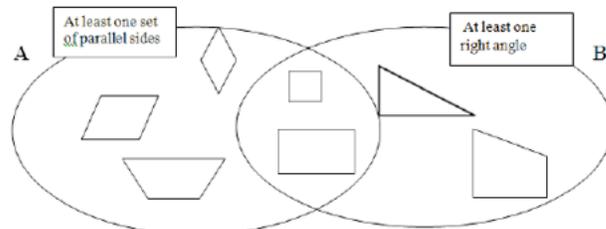
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

DESCRIPTION

This standard calls for students to sort objects based on parallelism, perpendicularity and angle types.

Example:

Which figure in the Venn diagram below is in the wrong place, explain how do you know?



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

Example:

Draw and name a figure that has two parallel sides and exactly 2 right angles.

Example:

For each of the following, sketch an example if it is possible. If it is impossible, say so, and explain why or show a counter example.

- A parallelogram with exactly one right angle.
- An isosceles right triangle.
- A rectangle that is not a parallelogram. (*impossible*)
- Every square is a quadrilateral.
- Every trapezoid is a parallelogram.

Guess My Rule

Students can be shown the two groups of shapes in part a and asked "Where does the shape on the left belong?" They might surmise that it belongs with the other triangles at the bottom. When the teacher moves it to the top, students must search for a different rule that fits all the cases.

Later (part b), students may induce the rule: "Shapes with at least one right angle are at the top." Students with rich visual images of right angles and good visualization skills would conclude that the shape at the left (even though it looks vaguely like another one already at the bottom) has one right angle, thus belongs at the top.

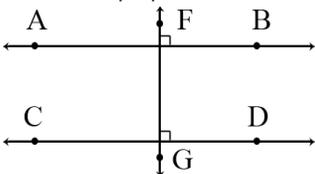
(*Progressions for the CCSSM, Geometry*, CCSS Writing Team, June 2012, page 15)

The notion of congruence ("same size and same shape") may be part of classroom conversation but the concepts of congruence and similarity do **not** appear until middle school.

TEACHER NOTE: In the U.S., the term "trapezoid" may have two different meanings. Research identifies these as inclusive and exclusive definitions. The inclusive definition states: A trapezoid is a quadrilateral with at least one pair of parallel sides. The exclusive definition states: **A trapezoid is a quadrilateral with exactly one pair of parallel sides.** With this definition, a parallelogram is not a trapezoid. North Carolina has adopted the exclusive definition. (*Progressions for the CCSSM: Geometry*, The Common Core Standards Writing Team, June 2012.)

FOURTH GRADE

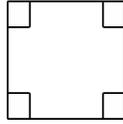
LEXILE GRADE LEVEL BAND: 740L TO 940L

ESSENTIAL QUESTION(S) FOR THE STANDARD	What geometric attributes classify 2 dimensional shapes and angles?		
MATHEMATICAL PRACTICE(S)	4.MP.5. Use appropriate tools strategically. 4.MP.6. Attend to precision.		
DOK Range Target for Instruction & Assessment	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
Instructional Targets	Know: Concepts/Skills	Think	Do
Assessment Types	Tasks assessing concepts, skills, and procedures	Tasks assessing expressing mathematical reasoning	Tasks assessing modeling/application
Students should be able to:	Identify parallel or perpendicular lines in two dimensional figures. Recognize acute, obtuse, and right angles. Identify right triangles.	Classify two-dimensional figures based on parallel or perpendicular lines and size of angles. Classify triangles as right triangles or not right.	
EXPLANATIONS AND EXAMPLES	<p>Two-dimensional figures may be classified using different characteristics such as, parallel or perpendicular lines or by angle measurement.</p> <p>Parallel or Perpendicular Lines:</p> <p>Students should become familiar with the concept of parallel and perpendicular lines. Two lines are parallel if they never intersect and are always equidistant. Two lines are perpendicular if they intersect in right angles (90°).</p> <p>Students may use transparencies with lines to arrange two lines in different ways to determine that the 2 lines might intersect in one point or may never intersect. Further investigations may be initiated using geometry software. These types of explorations may lead to a discussion on angles.</p> <p>Parallel and perpendicular lines are shown below:</p>  <p>Example:</p> <ul style="list-style-type: none"> Identify which of these shapes have perpendicular or parallel sides and justify your selection. 		

EXPLANATIONS AND EXAMPLES

A possible justification that students might give is:

The square has perpendicular lines because the sides meet at a corner, forming right angles.



Angle Measurement:

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

Right triangles can be a category for classification. A right triangle has one right angle. There are different types of right triangles. An isosceles right triangle has two or more congruent sides and a scalene right triangle has no congruent sides.

FOURTH GRADE

LEXILE GRADE LEVEL BAND: 740L TO 940L

STANDARD AND DECONSTRUCTION

<p>4.G.3</p>	<p>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.</p>		
<p>DESCRIPTION</p>	<p>This standard only includes line symmetry not rotational symmetry.</p> <p>Example:</p> <p>For each figure, draw all of the lines of symmetry. What pattern do you notice? How many lines of symmetry do you think there would be for regular polygons with 9 and 11 sides. Sketch each figure and check your predictions.</p> <p>Polgons with an odd number of sides have lines of symmetry that go from a midpoint of a side through a vertex.</p> <div style="text-align: center;">  </div>		
<p>ESSENTIAL QUESTION(S) FOR THE STANDARD</p>	<p>What geometric attribute is used to classify a shape as symmetrical?</p>		
<p>MATHEMATICAL PRACTICE(S)</p>	<p>4.MP.4. Model with mathematics. 4.MP.5. Use appropriate tools strategically. 4.MP.6. Attend to precision. 4.MP.7. Look for and make use of structure.</p>		
<p>DOK Range Target for Instruction & Assessment</p>	<p><input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p>		
<p>Instructional Targets</p>	<p>Know: Concepts/Skills</p>	<p>Think</p>	<p>Do</p>
<p>Assessment Types</p>	<p>Tasks assessing concepts, skills, and procedures</p>	<p>Tasks assessing expressing mathematical reasoning</p>	<p>Tasks assessing modeling/application</p>
<p>Students should be able to:</p>	<p>Recognize lines of symmetry for a two-dimensional figure.</p> <p>Recognize a line of symmetry as a line across a figure that when folded along creates matching parts.</p> <p>Identify line-symmetric figures.</p> <p>Draw lines of symmetry for two-dimensional figures.</p>		
<p>EXPLANATIONS AND EXAMPLES</p>	<p>Students need experiences with figures which are symmetrical and non-symmetrical. Figures include both regular and non-regular polygons. Folding cut-out figures will help students determine whether a figure has one or more lines of symmetry.</p>		



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