North Carolina Department of Public Instruction
**INSTRUCTIONAL SUPPORT TOOLS**
FOR ACHIEVING NEW STANDARDS

# *4th Grade Mathematics* ● Unpacked Content

For the new Common Core State Standards that will be effective in all North Carolina schools in the 2012-13.

This document is designed to help North Carolina educators teach the Common Core (Standard Course of Study). NCDPI staff are continually updating and improving these tools to better serve teachers.

**What is the purpose of this document?**
To increase student achievement by ensuring educators understand specifically what the new standards mean a student must know, understand and be able to do.

**What is in the document?**
Descriptions of what each standard means a student will know, understand and be able to do. The "unpacking" of the standards done in this document is an effort to answer a simple question "What does this standard mean that a student must know and be able to do?" and to ensure the description is helpful, specific and comprehensive for educators.

**How do I send Feedback?**
We intend the explanations and examples in this document to be helpful and specific. That said, we believe that as this document is used, teachers and educators will find ways in which the unpacking can be improved and made ever more useful. Please send feedback to us at feedback@dpi.state.nc.us and we will use your input to refine our unpacking of the standards. Thank You!

**Just want the standards alone?**
You can find the standards alone at http://corestandards.org/the-standards

**Mathematical Vocabulary** is identified in bold print. These are words that students should know and be able to use in context.

| Operations and Algebraic Thinking | 4.OA |
|---|---|
| **Common Core Cluster** | |
| **Use the four operations with whole numbers to solve problems.** | |

| **Common Core Standard** | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **4.OA.1** Interpret a **multiplication equation** as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. | **4.OA.1** Students should be given opportunities to write and identify equations and statements for multiplicative comparisons.<br><br>Example:<br>*5 x 8 = 40.*<br>Sally is five years old. Her mom is eight times older. How old is Sally's Mom?<br>*5 x 5 = 25*<br>Sally has five times as many pencils as Mary. If Sally has 5 pencils, how many does Mary have? |
| **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.[1]<br>[1] See Glossary, Table 2. | **4.OA.2** calls for students to translate comparative situations into equations with an unknown and solve.<br><br>Examples:<br>Unknown Product: A blue scarf costs $3. A red scarf costs 6 times as much. How much does the red scarf cost? (3 x 6 = p).<br>Group Size Unknown: A book costs $18. That is 3 times more than a DVD. How much does a DVD cost? (18 ÷ p = 3 or 3 x p = 18).<br>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 ÷ 6 = p or 6 x p = 18). |
| **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**. | **4.OA.3** 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.<br><br>Example:<br>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?<br>Some typical estimation strategies for this problem: |

| | |
|---|---|
| | Student 1<br>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<br>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<br>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<br>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<br>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. |

**4.OA.3** 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 ÷ 6 = ?** where the answers are best represented as:

- Problem A: 7
- Problem B: 7 r 2
- Problem C: 8
- Problem D: 7 or 8
- Problem E: $7\frac{2}{6}$

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 ÷ *6 = p; p = 7 r 2. Mary can fill 7 pouches completely.*

Problem **B: 7 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 ÷ *6 = p; p = 7 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 ÷ *6 = p; p = 7 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 ÷ *6 = p; p = 7 r 2; Some of her friends received 7 pencils. Two friends received 8 pencils.*

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

Example:

There are 128 students going on a field trip. If each bus held 30 students, how many buses are needed? *(128 ÷ 30 = b; b = 4 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.

## Common Core Cluster

**Gain familiarity with factors and multiples.**

| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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**. | **4.OA.4** 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.<br><br>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. |

## Common Core Cluster

**Generate and analyze patterns.**

| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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.* | **4.OA.5** 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.<br>Example:<br>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 x 0 + 4 | 4 |
| 1 | 3 x 1 + 4 | 7 |
| 2 | 3 x 2 + 4 | 10 |
| 3 | 3 x 3 + 4 | 13 |
| 4 | 3 x 4 + 4 | 16 |
| 5 | 3 x 5 + 4 | 19 |

# Number and Operation in Base Ten[1] 4.NBT

## Common Core Standard and Cluster

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

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

| | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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.<br>*For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* | **4.NBT.1** 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.<br><br>Example:<br>How is the 2 in the number 582 similar to and different from the 2 in the number 528? |
| **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.2** 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 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.<br><br>Students should also be able to compare two multi-digit whole numbers using appropriate symbols. |
| **4.NBT.3** Use place value understanding to **round** multi-digit whole numbers to any place. | **4.NBT.3** 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.<br><br>Example:<br>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.

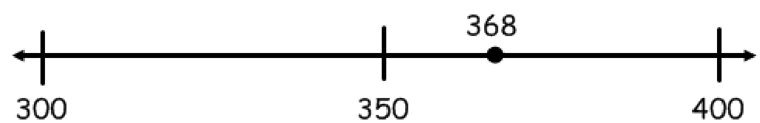
Example:
On a vacation, your family travels 267 miles on the first day, 194 miles on the second day and 34 miles on the third day. How many total miles did they travel?
Some typical estimation strategies for this problem:

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




.

## Common Core Cluster

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

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

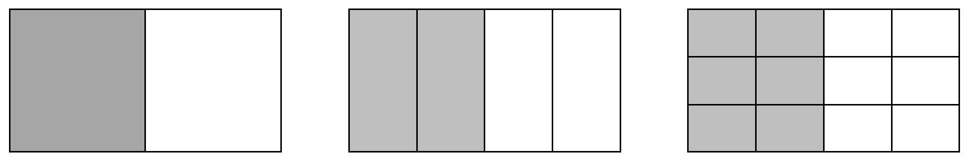
| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
| --- | --- |
| **4.NBT.4** Fluently **add** and **subtract** multi-digit whole numbers using the standard algorithm. | **4.NBT.4** refers to fluency, which means accuracy (reaching the correct answer), 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. |
| **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.5** calls for students to multiply numbers using a variety of strategies.<br><br>properties- **rules about how numbers work**<br><br>Example:<br>There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery?<br><br>Student 1<br>25 x12<br>I broke 12 up into 10 and 2<br>25 x 10 = 250<br>25 x 2 = 50<br>250 +50 = 300<br><br>Student 2<br>25 x 12<br>I broke 25 up into 5 groups of 5<br>5 x 12 = 60<br>I have 5 groups of 5 in 25<br>60 x 5 = 300<br><br>Student 3<br>25 x 12<br>I doubled 25 and cut 12 in half to get 50 x 6<br>50 x 6 = 300 |

<table>
<tr>
<td></td>
<td>
Example:<br>
What would an array area model of 74 x 38 look like?
<table>
<tr><td></td><td>70</td><td>4</td></tr>
<tr><td>30</td><td>70 x 30 = 2,100</td><td>4 x 30 = 120</td></tr>
<tr><td>8</td><td>70 x 8 = 560</td><td>4 x 8 = 32</td></tr>
</table>
2,100 = 560 + 1,200 + 32 = 2,812
</td>
</tr>
<tr>
<td>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.</td>
<td>
4.NBT.6 calls for students to explore division through various strategies.<br><br>
Example:<br>
There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many teams get created?
<table>
<tr>
<td>Student 1<br>592 divided by 8<br>There are 70 8’s in 560<br>592 - 560 = 32<br>There are 4 8’s in 32<br>70 + 4 = 74</td>
<td>Student 2<br>592 divided by 8<br>I know that 10 8’s is 80<br>If I take out 50 8’s that is 400<br>592 - 400 = 192<br>I can take out 20 more 8’s which is 160<br>192 - 160 = 32<br>8 goes into 32 4 times<br>I have none left<br>I took out 50, then 20 more, then 4 more<br>That’s 74</td>
<td>
<table>
<tr><td>592<br>-400</td><td>50</td></tr>
<tr><td>192<br>-160</td><td>20</td></tr>
<tr><td>32<br>-32</td><td>4</td></tr>
<tr><td>0</td><td></td></tr>
</table>
</td>
<td>Student 3<br>I want to get to 592<br>8 x 25 = 200<br>8 x 25 = 200<br>8 x 25 = 200<br>200 + 200 + 200 = 600<br>600 - 8 = 592<br>I had 75 groups of 8 and took one away, so there are 74 teams</td>
</tr>
</table>
</td>
</tr>
</table>

# Number and Operation – Fractions[1] 4.NF

## Common Core Cluster

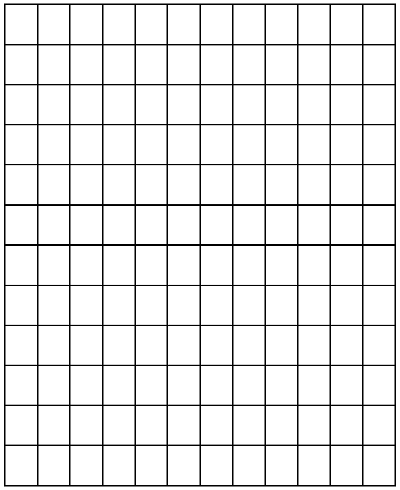
**Extend understanding of fraction equivalence and ordering.**
Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions.

| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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. | **4.NF.1** refers to visual fraction models. This includes area models , number lines or it could be a collection/set model.  See the Glossary for more information.<br><br>**4.NF.1** 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.<br><br>Example:<br><br>**1/2 = 2/4 = 6/12** |
| **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. | **4.NF.2** 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, ½ and 1/8 of  two medium pizzas is very different from ½ of one medium and 1/8 of one large).<br><br>Example:<br>Use patterns blocks.<br>1. If a red trapezoid is one whole, which block shows $\frac{1}{3}$?<br>2. If the blue rhombus is $\frac{1}{3}$, which block shows one whole?<br>3. If the red trapezoid is one whole, which block shows $\frac{2}{3}$? |

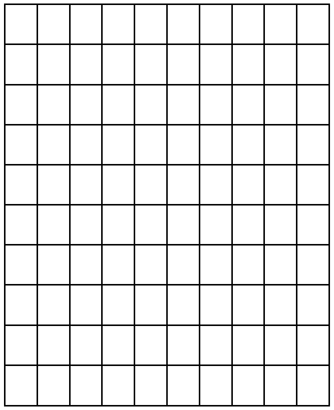
Mary used a 12 x 12 grid to represent 1 and Janet used a 10 x 10 grid to represent 1. Each girl shaded grid squares to show $\frac{1}{4}$. How many grid squares did Mary shade? How many grid squares did Janet shade? Why did they need to shade different numbers of grid squares?

*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.*

Mary's grid



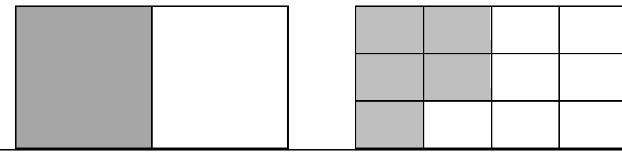
Janet's grid



Example:

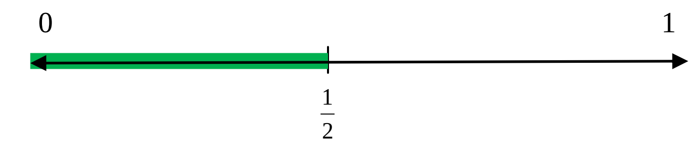
There are two cakes on the counter that are the same size. The first cake has ½ of it left. The second cake has 5/12 left. Which cake has more left?

Student 1
Area model:
The first cake has more left over. The second cake has 5/12 left which is smaller than ½.

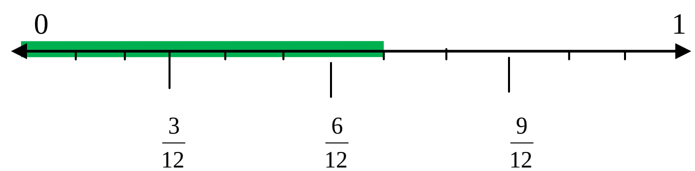


Student 2
Number Line model:

*First Cake*



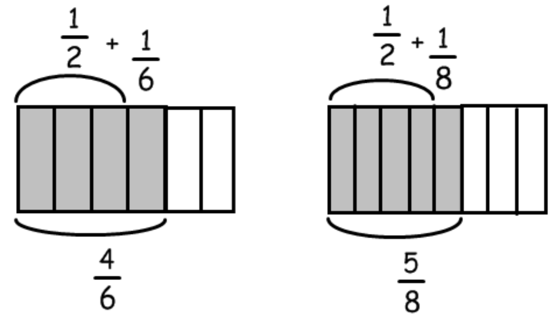

*Second Cake*




Student 3
verbal explanation:
I know that 6/12 equals ½. Therefore, the second cake which has 7/12 left is greater than ½.

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:

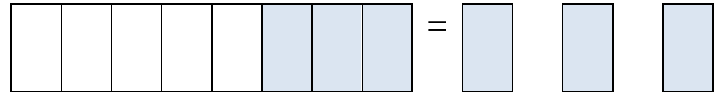
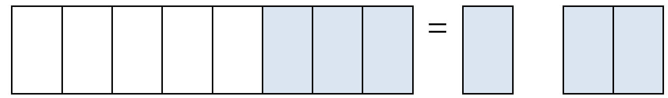
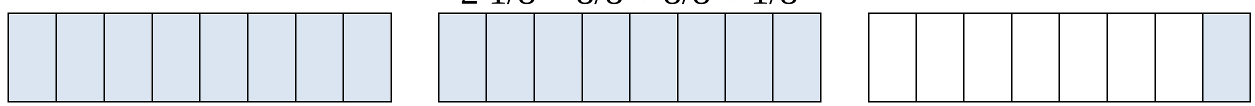


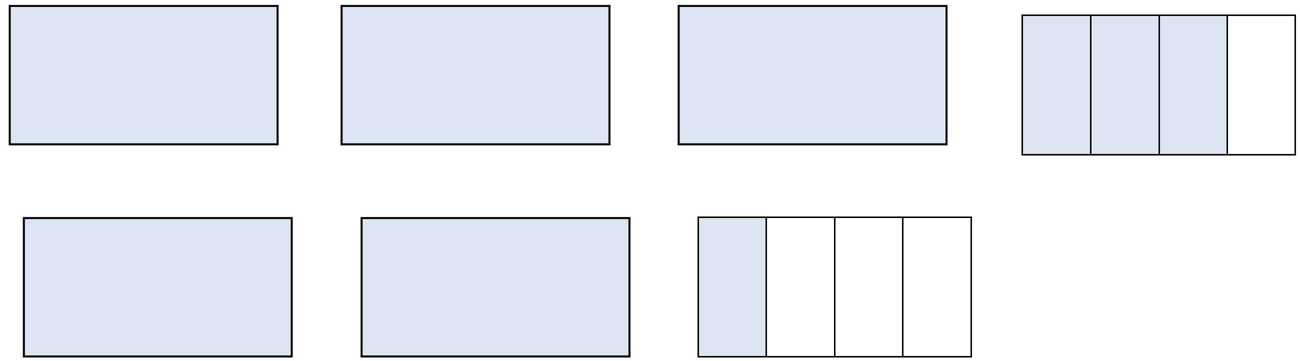
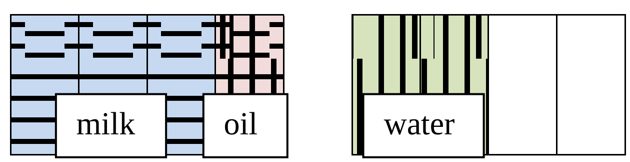

$\frac{4}{6}$ is $\frac{1}{6}$ larger than $\frac{1}{2}$, while $\frac{5}{8}$ is $\frac{1}{8}$ larger than $\frac{1}{2}$. Since $\frac{1}{6}$ is greater than $\frac{1}{8}$, $\frac{4}{6}$ is the greater fraction.

## Common Core Cluster

**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.

| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **4.NF.3** Understand a **fraction** *a*/*b* with *a* > 1 as a sum of fractions 1/*b*.<br>a. Understand **addition** and **subtraction** of fractions as **joining and separating parts** referring to the same whole. | **4.NF.3a** refers to the joining (composing) of unit fractions or separating fractions of the same whole.<br><br>Example: 4/5 = 1/5 + 1/5 + 1/5 + 1/5 + 1/5 |

| | |
|---|---|
| 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.<br>*Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* | **4.NF.3b** 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.<br>Example:<br>3/8 = 1/8 + 1/8 + 1/8<br><br>3/8 = 1/8 + 2/8<br><br>2 1/8 = 1 + 1 + 1/8<br><br>or<br>2 1/8 = 8/8 + 8/8 + 1/8<br> |
| 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.3c** 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 into improper fractions.<br><br>Example: |

| | |
|---|---|
| | While solving the problem, 3 ¾ + 2 ¼ students could do the following:<br><br>Student 1<br>3 + 2 = 5 and ¾ + ¼ = 1 so 5+ 1 = 6<br><br>Student 2<br>3 ¾ + 2 = 5 ¾ so 5 ¾ + ¼ = 6<br><br>Student 3<br>3 ¾ = 15/4 and 2 ¼ = 9/4 so 15/4 + 9/4 = 24/4 = 6 |
| 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. | **4.NF.3d** A cake recipe calls for you to use ¾ cup of milk, ¼ cup of oil, and 2/4 cup of water. How much liquid was needed to make the cake?<br><br><br>**3/4** + **1/4** + **2/4** **= 6/4 = 1 1/4** |

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

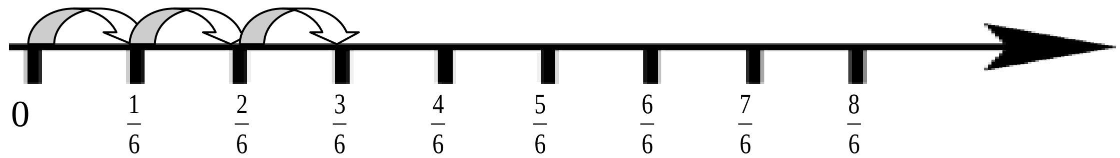
a. Understand a fraction *a*/*b* as a multiple of 1/*b*.
*For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

**4.NF.4a** builds on students' work of adding fractions and extending that work into multiplication.

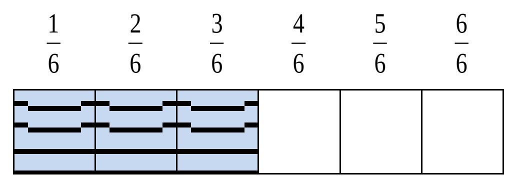
Example:

3/6 = 1/6 + 1/6 + 1/6 = 3 x (1/6)

Number line:

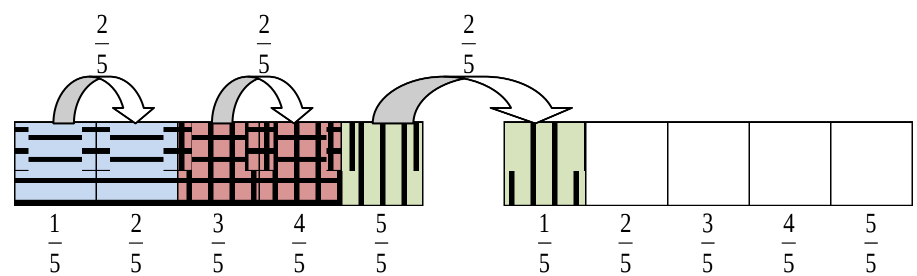



Area model:




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

**4.NF.4b** extended the idea of multiplication as repeated addition. For example, 3 x (2/5) = 2/5 + 2/5 + 2/5 = 6/5 = 6 x (1/5). Students are expected to use and create visual fraction models to multiply a whole number by a fraction.

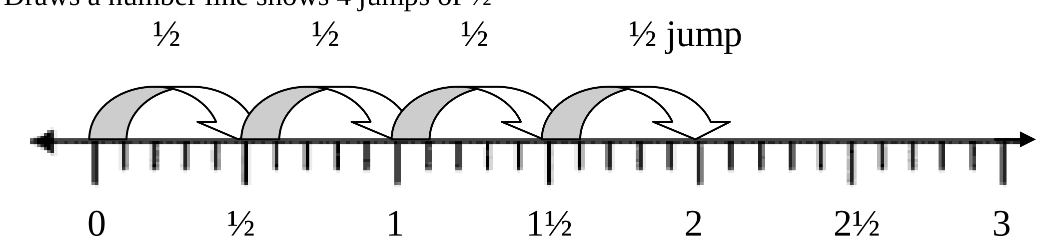


c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.
*For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast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

**4.NF.4c** calls for students to use visual fraction models to solve word problems related to multiplying a whole number by a fraction.

Example: In a relay race, each runner runs ½ of a lap. If there are 4 team members how long is the race?

Student 1
Draws a number line shows 4 jumps of ½

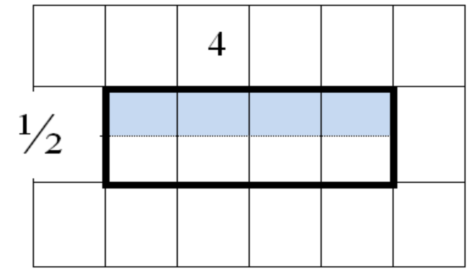



Student 2
Draws an area model showing 4 pieces of ½ joined together to equal 2.

| | |
|---|---|
| ½ | ½ |

| | |
|---|---|
| ½ | ½ |

Student 3
Draws an area model representing 4 x ½ on a grid, dividing one row into ½ 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 reasoning.

a. Heather and Paul ate the same number of plums.
b. Heather ate 4 plums and Paul ate 3 plums.
c. Heather ate 3 plums and Paul ate 4 plums.
d. Heather had 9 plums remaining.

## Common Core Cluster

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

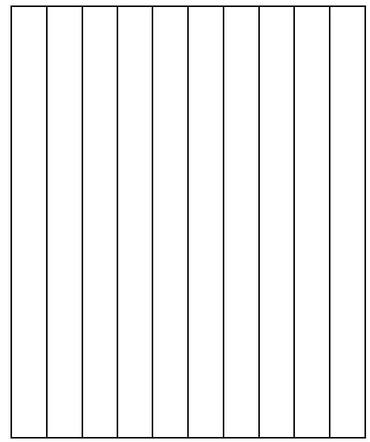
| Common Core Standard | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **4.NF.5** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.[2] | **4.NF.5** 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. |

*For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

[2] Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.

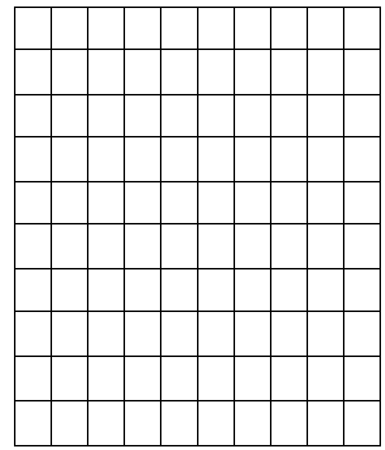
| **Ones** | **.** | **Tenths** | **Hundredths** |
|---|---|---|---|

**Tenths Grid**

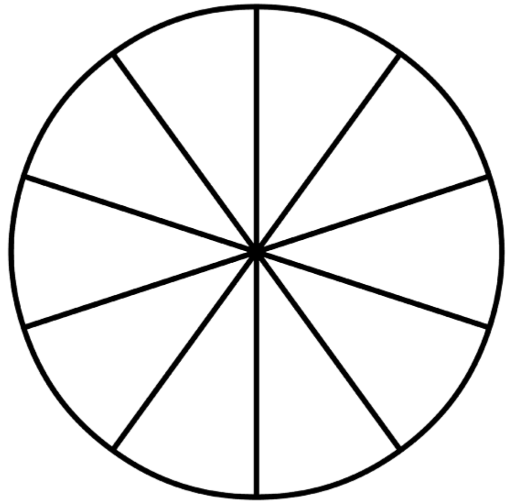
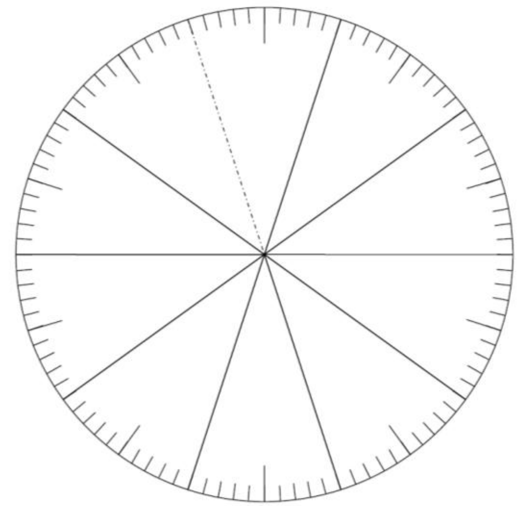


**.3 = 3 tenths = 3/10**

**Hundredths Grid**



**.30 = 30 hundredths = 30/100**

| | |
|---|---|
| | Represent 3 tenths and 30 hundredths on the models below.<br>10ths circle <br>100ths circle  |
| **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.* | **4.NF.6** 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. |
| **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. | **4.NF.7** 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. |

| **Measurement and Data** | **4.MD** |
|---|---|
| **Common Core Cluster** | |
| **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** | |

| **Common Core Standard** | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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. *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), ...* | **4.MD.1** involves working with both metric and customary systems which have been introduced in the previous grades. However, conversions should be within only one system of measurement. Students should have ample time to explore the patterns and relationships in the conversion tables that they create.<br><br>Example:<br>Customary length conversion table<br><br>Yards / Feet: 1 / 3; 2 / 6; 3 / 9; ***n*** / ***n*** x 3<br><br>**measure, metric, customary, convert/conversion, relative size, liquid volume, mass, length, distance, kilometer (km), meter (m), centimeter (cm), kilogram (kg), gram (g), liter (L), milliliter (mL), inch (in), foot (ft), yard (yd), mile (mi), ounce (oz), pound (lb), cup (c), pint (pt), quart (qt), gallon (gal), elapsed time, hour, minute, second**<br><br>Foundational understandings to help with measure concepts:<br>Understand that larger units can be subdivided into equivalent units (partition).<br>Understand that the same unit can be repeated to determine the measure (iteration).<br>Understand the relationship between the size of a unit and the number of units needed (compensatory principal). |

| Yards | Feet |
|---|---|
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| ***n*** | ***n*** x 3 |

**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.

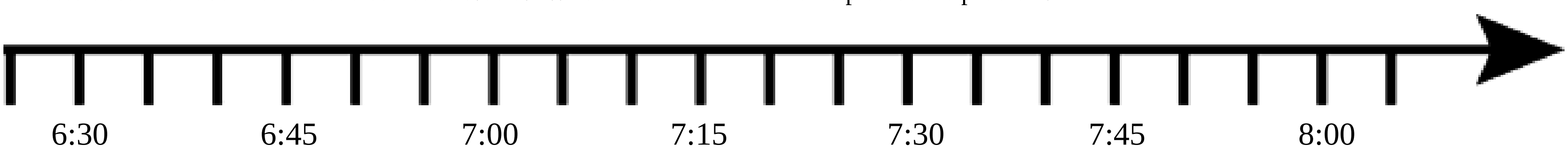
**4.MD.2** includes multi-step word problems related to expressing measurements from a larger unit in terms of a smaller unit (e.g., feet to inches, meters to centimeter, dollars to cents). Students should have ample opportunities to use number line diagrams to solve word problems.

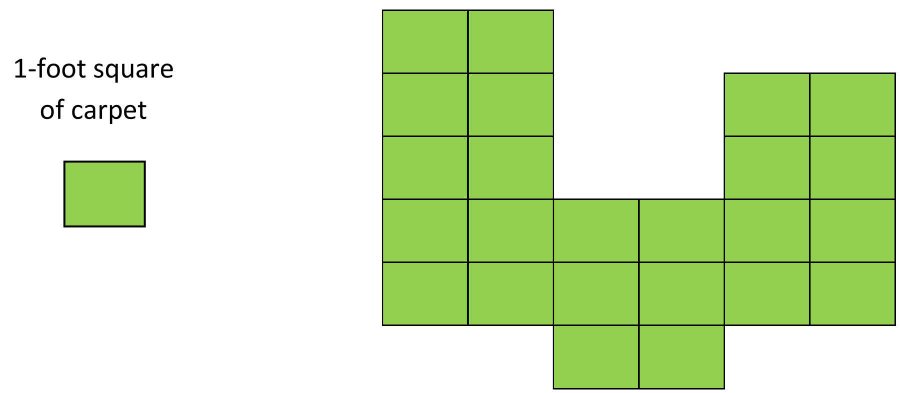
Example:
Charlie and 10 friends are planning for a pizza party. They purchased 3 quarts of milk. If each glass holds 8oz will everyone get at least one glass of milk?
*possible solution: Charlie plus 10 friends = 11 total people*
*11 people x 8 ounces (glass of milk) = 88 total ounces*
*1 quart = 2 pints = 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.*

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.

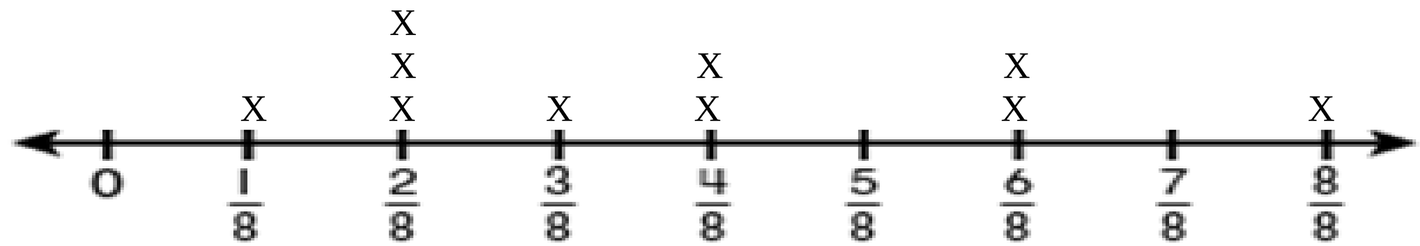


| | |
|---|---|
| **4.MD.3** Apply the **area** and **perimeter** formulas for **rectangles** in real world and mathematical problems.<br>*For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.* | **4.MD.3** calls for students to generalize their understanding of area and perimeter by connecting the concepts to mathematical formulas. These formulas should be developed through experience not just memorization.<br>Example:<br>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?<br> |

## Common Core Cluster

**Represent and interpret data.**

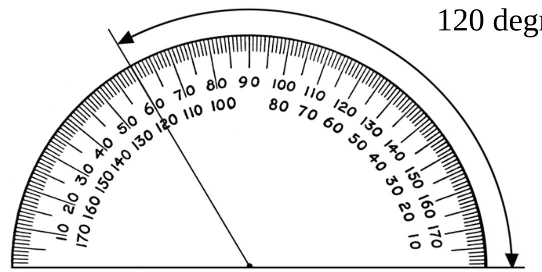
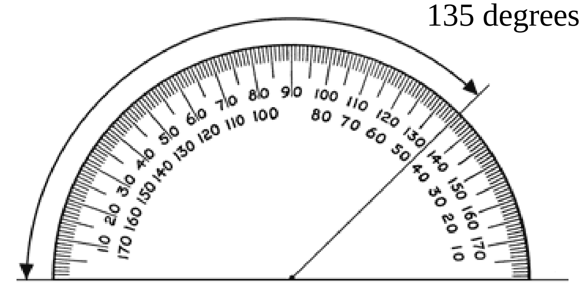
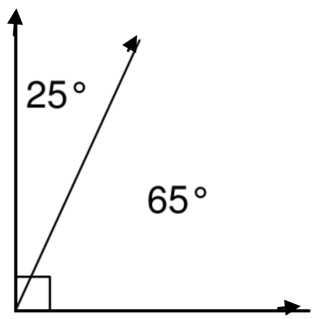
| **Common Core Standard** | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **4.MD.4** Make a **line plot** to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.<br>*For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.* | **4.MD.4** This standard provides a context for students to work with fractions by measuring objects to an eighth of an inch. Students are making a line plot of this data and then adding and subtracting fractions based on data in the line plot.<br><br>Example:<br>Students measured objects in their desk to the nearest ½, ¼, or 1/8 inch. They displayed their data collected on a line plot. How many object measured ¼ inch? ½ inch? If you put all the objects together end to end what would be the total length of **all** the objects. |




## Common Core Cluster

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

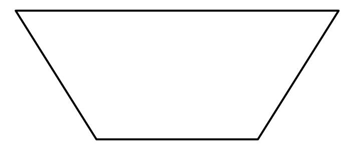
| Common Core Standard | Unpacking<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **4.MD.5** Recognize **angles** as geometric shapes that are formed wherever two **rays** share a common **endpoint,** and understand concepts of angle measurement:<br>a. An angle is 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. | **4.MD.5a** brings up a connection between angles and circular measurement (360 degrees). |
| b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. | **4.MD.5b** calls for students to explore an angle as a series of "one-degree turns."<br>A water sprinkler rotates one-degree at each interval. If the sprinkler rotates a total of 100 degrees, how many one-degree turns has the sprinkler made? |

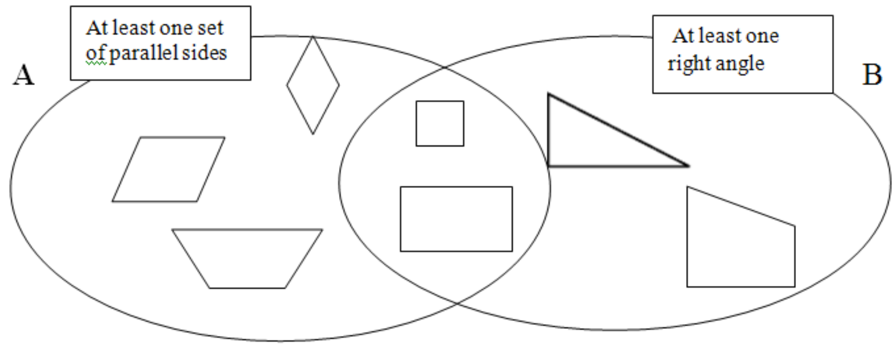
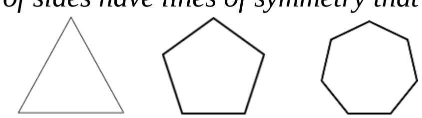
| | |
|---|---|
| **4.MD.6 Measure angles** in whole-number degrees using a **protractor**. Sketch angles of specified measure. | **4.MD.6** measure angles and sketch angles     |
| **4.MD.7** Recognize angle measure as additive. When an angle is **decomposed** into non-overlapping parts, the angle measure 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. | **4.MD.7** addresses the idea of decomposing (breaking apart) an angle into smaller parts.   <br>Example:<br>A lawn water sprinkler rotates 65 degress 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?<br>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? |

## Geometry 4.G

### Common Core Cluster

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

| Common Core Standard | **Unpacking**<br>What do these standards mean a child will know and be able to do? |
|---|---|
| **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.G.1** 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.<br><br>Example:<br>Draw two different types of quadrilaterals that have two pairs of parallel sides?<br>Is it possible to have an acute right triangle? Justify your reasoning using pictures and words.<br><br>Example:<br>How many acute, obtuse and right angles are in this shape? <br><br>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.<br><br>**Figures from previous grades: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, trapezoid, half/quarter circle, circle** |
| **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. | **4.G.2** calls for students to sort objects based on parallelism, perpendicularity and angle types.<br>Example: |

| | |
|---|---|
| | <br>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.<br><br>Example:<br>Draw and name a figure that has two parallel sides and exactly 2 right angles.<br><br>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.<br>• A parallelogram with exactly one right angle.<br>• An isosceles right triangle.<br>• A rectangle that is *not* a parallelogram. *(impossible)*<br>• Every square is a quadrilateral.<br>• Every trapezoid is a parallelogram. |
| **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. | **4.G.3** only includes line symmetry.<br><br>Example:<br>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.<br><br>*Polygons with an odd number of sides have lines of symmetry that go from a midpoint of a side through a vertex.*<br> |