5th Grade Mathematics

Unit 2 Curriculum Map – Math in Focus

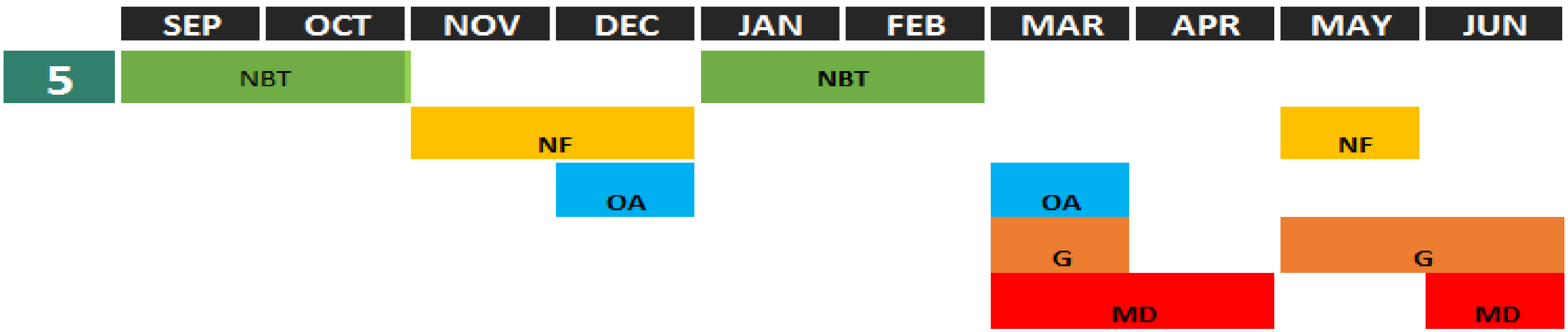
Fractions, Decimals, and Algebraic Expressions

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

A STORY OF UNITS



Numbers Base Ten: Understand the place value system and perform operations with multi-digit whole numbers and with decimals to hundredths

Numbers and Operations-Fractions: Use equivalent fractions as a strategy to add and subtract fractions and apply and extend previous understandings of multiplication and division to multiply and divide fractions

Operations and Algebraic Thinking: Write and interpret numerical expressions and analyze patterns and relationships

Geometry: Graph points on the coordinate plane to solve real-world and mathematical problems and classify two-dimensional figures into categories based on their properties

Measurment and Data: Convert like measurement units within a given measurement system, represent and interpret data, and understand concepts of volume and relate volume to mulitplication and division

Table of Contents

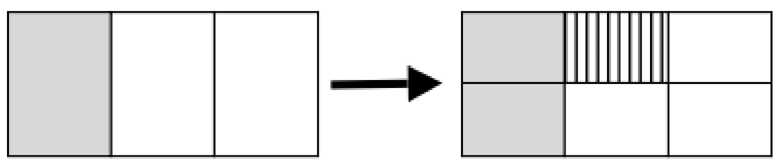
Unit Overview

Unit 2: Chapters 4,5, 6.1, and 8
In this Unit Students will be:
• Multiplying and Dividing whole numbers, proper fractions, improper fractions, and mixed numbers in any combination. • Using algebraic expressions to describe situations and solve real world problems. • Representing thousandths as three-place decimals or as fractions.
Essential Questions
➢ How do you show multiplication and division of whole numbers, fractions, and mixed numbers (in any combination) using visual models? ➢ How is fraction multiplication and division related to whole number multiplication and division? ➢ What happens to a fraction when you multiply it by a whole number? ➢ What can affect the relationship between numbers? ➢ How do you translate words into expressions? ➢ How does grouping symbols affect order of operations?
Enduring Understandings
• Chapter 4: Multiplying and Dividing Fractions and Mixed Numbers ✓ Multiplying Proper Fractions ✓ Multiplying Improper Fractions by Fractions ✓ Multiplying Mixed Numbers and Whole Numbers ✓ Dividing a Fraction by a Whole Number ✓ Dividing a Whole Number by a Unit Fraction ✓ Solve Real World problems • Chapter 5: Algebra ✓ Identify and extend number patterns ✓ Identify the relationship between two sets of numbers ✓ Recognize, write, and evaluate simple algebraic expressions in one variable • Chapter 8: Decimals ✓ Read and write decimals ✓ Place value ✓ Compare and order ✓ Round to the nearest hundredth ✓ Rewrite decimals as fractions and mixed numbers

• *New Jersey Student Learning Standards*	
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. For example, ⅔+ 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

This standard builds on the work in fourth grade where students add fractions with like denominators. In fifth grade, the example provided in the standard ⅔+ ¾ has students find a common denominator by finding the product of both denominators. This process should come after students have used visual fraction models (area models, number lines, etc.) to build understanding before moving into the standard algorithm describes in the standard The use of these visual fraction models allows students to use reasonableness to find a common denominator prior to using the algorithm. For example, when adding ⅓+ ⅙, Grade 5 students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators.

Example: ⅓+ ⅙



1/3 is the same as 2/6

I drew a rectangle and shaded 1/3. I knew that if I cut every third in half then I would have sixths. Based on my picture, ⅓ equals 2/6. Then I shaded in another ⅙ with stripes. I ended up with an answer of 3/6, which is equal to 1/2. On the contrary, based on the algorithm that is in the example of the Standard, when solving ⅓+ ⅙, multiplying 3 and 6 gives a common denominator of 18. Students would make equivalent fractions 6/18 + 3/18 = 9/18 which is also equal to one-half. Please note that while multiplying the denominators will always give a common denominator, this may not result in the smallest denominator.

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

Examples:

$$\frac{2}{5} + \frac{7}{8} = \frac{16}{40} + \frac{35}{40} = \frac{51}{40}$$

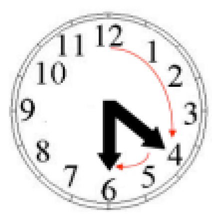
$$3\frac{1}{4} - \frac{1}{6} = 3\frac{3}{12} - \frac{2}{12} = 3\frac{1}{12}$$

Fifth grade students will need to express both fractions in terms of a new denominator with adding unlike denominators. For example, in calculating ⅔ + 5/4 they reason that if each third in ⅔ is subdivided into fourths and each fourth in 5/4 is subdivided into thirds, then each fraction will be a sum of unit fractions with denominator 3 x 4 = 4 x 3 + 12:

$$\frac{2}{3}+\frac{5}{4}=\frac{2\times 4}{3\times 4}+\frac{5\times 3}{4\times 3}=\frac{8}{12}+\frac{15}{12}=\frac{23}{12}$$

It is not necessary to find a least common denominator to calculate sums of fractions, and in fact the effort of finding a least common denominator is a distraction from understanding adding fractions. (Progressions for the CCSSM, Number and Operation – Fractions, CCSS Writing Team, August 2011, page 10)

Example: Present students with the problem ⅓ + ⅙. Encourage students to use the clock face as a model for solving the problem. Have students share their approaches with the class and demonstrate their thinking using the clock model.

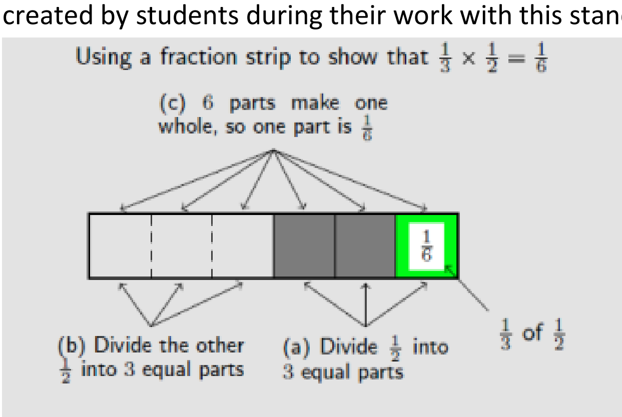


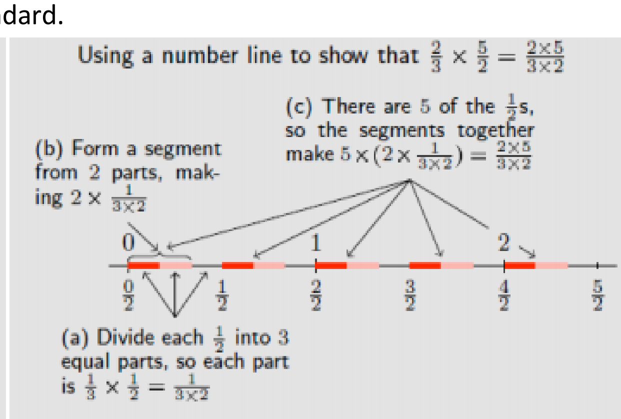
5.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

Students need to develop a fundamental understanding that the multiplication of a fraction by a whole number could be represented as repeated addition of a unit fraction (e.g., 2 x (¼) = ¼+ ¼.

5.NF.4a	Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (⅔) × 4 = 8/3, and create a story context for this equation. Do the same with (⅔) × (⅘) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)

This standard extends student's work of multiplication from earlier grades. In fourth grade, students worked with recognizing that a fraction such as ⅗ actually could be represented as 3 pieces that are each one-fifth (3 x (⅕)). This standard references both the multiplication of a fraction by a whole number and the multiplication of two fractions. Visual fraction models (area models, tape diagrams, number lines) should be used and created by students during their work with this standard.





As they multiply fractions such as 3/5 x 6, they can think of the operation in more than one way.

- 3 x (6 ÷ 5) or (3 x 6/5)
- (3 x 6) ÷ 5 or 18 ÷ 5 (18/5)

Students create a story problem for ⅗ x 6 such as,

- Isabel had 6 feet of wrapping paper. She used ⅗ of the paper to wrap some presents. How much does she have left?
- Every day Tim ran ⅗ of mile. How far did he run after 6 days? (Interpreting this as 6 x ⅗)

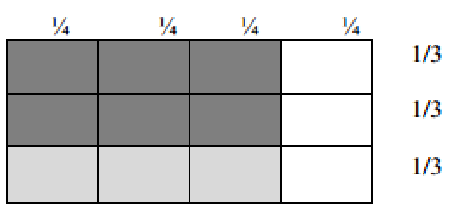
Example:

Three-fourths of the class is boys. Two-thirds of the boys are wearing tennis shoes. What fraction of the class are boys with tennis shoes? This question is asking what ⅔ of ¾ is, or what is ⅔ x ¾. What is ⅔ x ¾, in this case you have ⅔ groups of size ¾ (a way to think about it in terms of the language for whole numbers is 4 x 5 you have 4 groups of size 5. The array model is very transferable from whole number work and then to binomials.

<table>
<tr>
<td>

Student 1

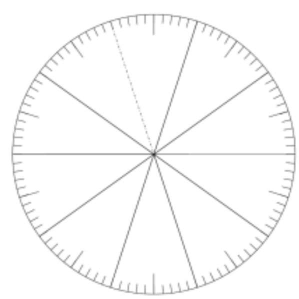
I drew a rectangle to represent the whole class. The four columns represent the fourths of a class. I shaded 3 columns to represent the fraction that are boys. I then split the rectangle with horizontal lines into thirds. The dark area represents the fraction of the boys in the class wearing tennis shoes, which is 6 out of 12. That is 6/12, which equals 1/2.



</td>
<td>

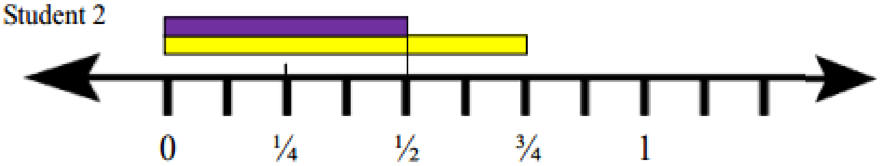
Student 3

Fraction circle could be used to model student thinking. First I shade the fraction circle to show the ¾ and then overlay with ⅔ of that?



</td>
</tr>
<tr>
<td colspan="2">

Student 2

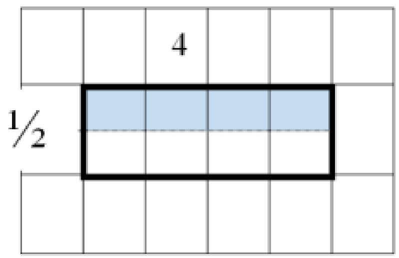


</td>
</tr>
</table>

5.NF.4b	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.

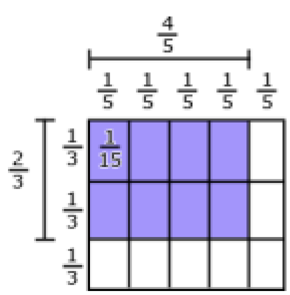
This standard extends students' work with area. In third grade students determine the area of rectangles and composite rectangles. In fourth grade students continue this work. The fifth grade standard calls students to continue the process of covering (with tiles). Grids (see picture) below can be used to support this work.

***Example**: The home builder needs to cover a small storage room floor with carpet. The storage room is 4 meters long and half of a meter wide. How much carpet do you need to cover the floor of the storage room? Use a grid to show your work and explain your answer. In the grid below I shaded the top half of 4 boxes. When I added them together, I added ½ four times, which equals 2. I could also think about this with multiplication ½ x 4 is equal to 4/2 which is equal to 2.*



Example:

In solving the problem ⅔ x ⅘, students use an area model to visualize it as a 2 by 4 array of small rectangles each of which has side lengths ⅓ and ⅕. They reason that ⅓ x ⅕= 1/(3 x 5) by counting squares in the entire rectangle, so the area of the shaded area is (2 x 4) x 1/(3 x 5) = $\frac{2 \times 4}{3 \times 5}$. They can explain that the product is less than ⅘ because they are finding ⅔ of ⅘. They can further estimate that the answer must be between ⅖ and ⅘ because ⅔ of ⅘ is more than ½ of ⅘ and less than one group of ⅘.



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

5.NF.5a	Interpret multiplication as scaling (resizing), by comparing the size of a product to the size of one factor based on the size of the other factor, without performing the indicated multiplication.

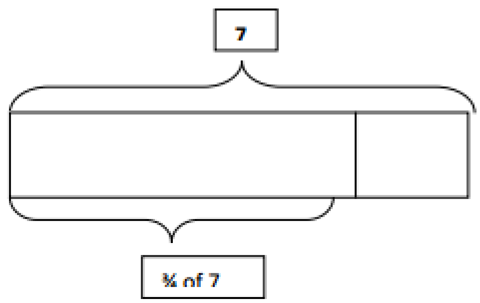
This standard calls for students to examine the magnitude of products in terms of the relationship between two types of problems. This extends the work with 5.OA.1.

Example 1: Mrs. Jones teaches in a room that is 60 feet wide	Example 2: How does the product of 225 x 60 compare to the

and 40 feet long. Mr. Thomas teaches in a room that is half as wide, but has the same length. How do the dimensions and area of Mr. Thomas' classroom compare to Mrs. Jones' room? Draw a picture to prove your answer.	product of 225 x 30? How do you know? Since 30 is half of 60, the product of 22 5x 60 will be double or twice as large as the product of 225 x 30.

Example:

¾ x 7 is less than 7 because 7 is multiplied by a factor less than 1 so the product must be less than 7.



5.NF.5b	Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n × a)/(n × b) to the effect of multiplying a/b by 1.

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

Example:

Mrs. Bennett is planting two flower beds. The first flower bed is 5 meters long and 6/5 meters wide. The second flower bed is 5 meters long and ⅚ meters wide. How do the areas of these two flower beds compare? Is the value of the area larger or smaller than 5 square meters? Draw pictures to prove your answer.

Example:

2 ⅔ x 8 must be more than 8 because 2 groups of 8 is 16 and 2 ⅔ is almost 3 groups of 8. So the answer must be close to, but less than 24.

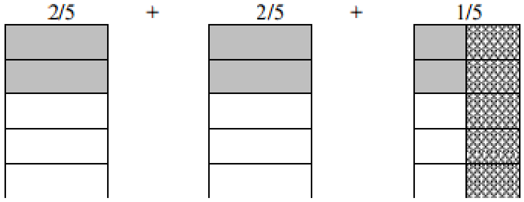
$\frac{3}{4} = \frac{5 \times 3}{5 \times 4}$ because multiplying ¾ by 5/5 is the same as multiplying by 1.

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.

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

Example:

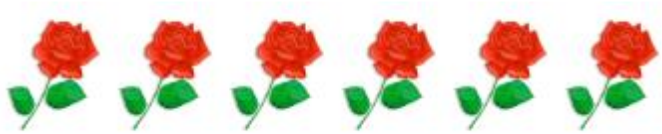
There are 2 ½ bus loads of students standing in the parking lot. The students are getting ready to go on a field trip. ⅖ of the students on each bus are girls. How many buses would it take to carry only the girls?

Student 1	Student 2
I drew 3 grids and 1 grid represents 1 bus. I cut the third grid in half and I marked out the right half of the third grid, leaving 2 ½ grids. I then cut each grid into fifths, and shaded two-fifths of each grid to represent the number of girls. When I added up the shaded pieces, ⅖ of the 1st and 2nd bus were both shaded, and ⅕ of the last bus was shaded. 2/5 + 2/5 + 1/5 = 5/5 = 1 whole bus. 	2 ½ x ⅖= I split the 2 ½ into 2 and ½ 2 x ⅖= ⅘ ½ x ⅖= 2/10 I then added 4/5 and 2/10. That equals 1 whole bus load.

Example:

Evan bought 6 roses for his mother. ⅔ of them were red. How many red roses were there?

Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.



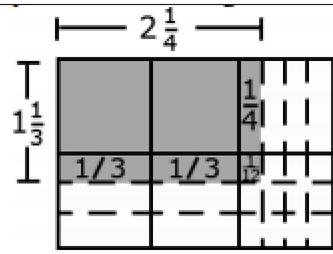
A student can use an equation to solve.

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

Example:

Mary and Joe determined that the dimensions of their school flag needed to be 1 ⅓ ft. by 2¼ ft. What will be the area of the school flag?

A student can draw an array to find this product and can also use his or her understanding of decomposing numbers to explain the multiplication. Thinking ahead a student may decide to multiply by 1 ⅓ instead of 2 ¼ .



The explanation may include the following:

• First, I am going to multiply 2 ¼ by 1 and then by ⅓.

• When I multiply 2 ¼ by 1, it equals 2 ¼ .

• Now I have to multiply 2 ¼ by ⅓.

• ⅓ times 2 is ⅔.

• ⅓ times ¼ is 1/12 .

• So the answer is 2 ¼ + ⅔+ 1/12 or 2 3/12+ 8/12 + 1/12= 2 12/12 = 3

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

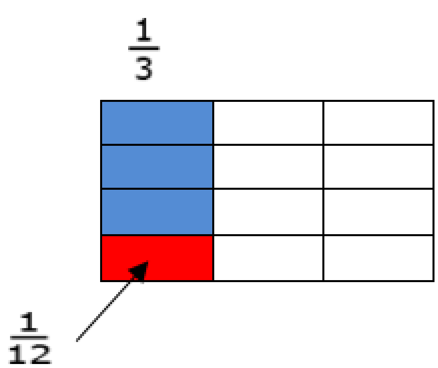
This is the first time that students are dividing with fractions. In fourth grade students divided whole numbers, and multiplied a whole number by a fraction. The concept unit fraction is a fraction that has a one in the denominator. For example, the fraction ⅗ is 3 copies of the unit fraction ⅕. ⅕+ ⅕+ ⅕= ⅗= ⅕x 3 or 3 x ⅕.

Example:

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

Four students sitting at a table were given ⅓ of a pan of brownies to share. How much of a pan will each student get if they share the pan of brownies equally?

The diagram shows the ⅓ pan divided into 4 equal shares with each share equaling 1/12 of the pan.



5.OA.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

The order of operations is introduced in third grade and is continued in fourth. This standard calls for students to evaluate expressions with parentheses ( ), brackets [ ] and braces { }. In upper levels of mathematics, evaluate means to substitute for a variable and simplify the expression. However at this level students are to only simplify the expressions because there are no variables.

Example:

Evaluate the expression 2{ 5[12 + 5(500 - 100) + 399]}

Students should have experiences working with the order of first evaluating terms in parentheses, then brackets, and then braces.

The first step would be to subtract 500 – 100 = 400. Then multiply 400 by 5 = 2,000.

Inside the bracket, there is now [12 + 2,000 + 399]. That equals 2,411.

Next multiply by the 5 outside of the bracket. 2,411 x 5 = 12,055.

Next multiply by the 2 outside of the braces. 12,055 x 2= 24,110.

Mathematically, there cannot be brackets or braces in a problem that does not have parentheses. Likewise, there cannot be braces in a problem that does not have both parentheses and brackets.

This standard builds on the expectations of third grade where students are expected to start learning the conventional order. Students need experiences with multiple expressions that use grouping symbols throughout the year to develop understanding of when and how to use parentheses, brackets, and braces. First, students use these symbols with whole numbers. Then the symbols can be used as students add, subtract, multiply and divide decimals and fractions.

Example:

- (26 + 18) ÷ 4 Solution: 11
- {[2 x (3+5)] – 9} + [5 x (23-18)] Solution: 32
- 12 – (0.4 x 2) Solution: 11.2
- (2 + 3) x (1.5 – 0.5) Solution: 5
- 6- (½+⅓) Solution: 5⅙
- { 80 ÷ [2 x (3 ½ + 1 ½)] }+ 100 Solution: 108

To further develop students' understanding of grouping symbols and facility with operations, students place grouping symbols in equations to make the equations true or they compare expressions that are grouped differently. Example: • 15 - 7 – 2 = 10 → 15 - (7 – 2) = 10 • 3 x 125 ÷ 25 + 7 = 22 → [3 x (125 ÷ 25)] + 7 = 22 • 24 ÷ 12 ÷ 6 ÷ 2 = 2 x 9 + 3 ÷ ½ → 24 ÷ [(12 ÷ 6) ÷ 2] = (2 x 9) + (3 ÷ ½) • Compare 3 x 2 + 5 and 3 x (2 + 5) • Compare 15 – 6 + 7 and 15 – (6 + 7) In fifth grade, students work with exponents only dealing with powers of ten (5.NBT.2). Students are expected to evaluate an expression that has a power of ten in it. Example: **3 {2 + 5 [5 + 2 x 10^4]+ 3}** In fifth grade students begin working more formally with expressions. They write expressions to express a calculation, e.g., writing 2 x (8 + 7) to express the calculation "add 8 and 7, then multiply by 2." They also evaluate and interpret expressions, e.g., using their conceptual understanding of multiplication to interpret 3 x (18932 x 921) as being three times as large as 18932 + 921, without having to calculate the indicated sum or product. Thus, students in Grade 5 begin to think about numerical expressions in ways that prefigure their later work with variable expressions (e.g., three times an unknown length is 3 x L). In Grade 5, this work should be viewed as exploratory rather than for attaining mastery; for example, expressions should not contain nested grouping symbols, and they should be no more complex than the expressions one finds in an application of the associative or distributive property, e.g., (8 + 27) + 2 or (6 x 30) (6 x 7). Note however that the numbers in expressions need not always be whole numbers. (Progressions for the CCSSM, Operations and Algebraic Thinking, CCSS Writing Team, April 2011, page 32)	
5.OA.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.
This standard refers to expressions. Expressions are a series of numbers and symbols (+, -, x, ÷) without an equals sign. Equations result when two expressions are set equal to each other (2 + 3 = 4 + 1). Example: 4(5 + 3) is an expression. When we compute 4(5 + 3) we are evaluating the expression. The expression equals 32. 4(5 + 3) = 32 is an equation. This standard calls for students to verbally describe the relationship between expressions without actually	

calculating them. This standard calls for students to apply their reasoning of the four operations as well as place value while describing the relationship between numbers. The standard does not include the use of variables, only numbers and signs for operations.
Example:

Write an expression for the steps “double five and then add 26.”

Student
(2 x 5) + 26

Describe how the expression 5(10 x 10) relates to 10 x 10.

Student
The expression 5(10 x 10) is 5 times larger than the expression 10 x 10 since I know that I that 5(10 x 10) means that I have 5 groups of (10 x 10).

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.

This standard extends the work from Fourth Grade, where students generate numerical patterns when they are given one rule. In Fifth Grade, students are given two rules and generate two numerical patterns. The graphs that are created should be line graphs to represent the pattern. This is a linear function which is why we get the straight lines. The Days are the independent variable, Fish are the dependent variables, and the constant rate is what the rule identifies in the table.

Make a chart (table) to represent the number of fish that Sam and Terri catch.

Days	Sam's Total Number of Fish	Terri's Total Number of Fish
0	0	0
1	2	4
2	4	8
3	6	12
4	8	16
5	10	20

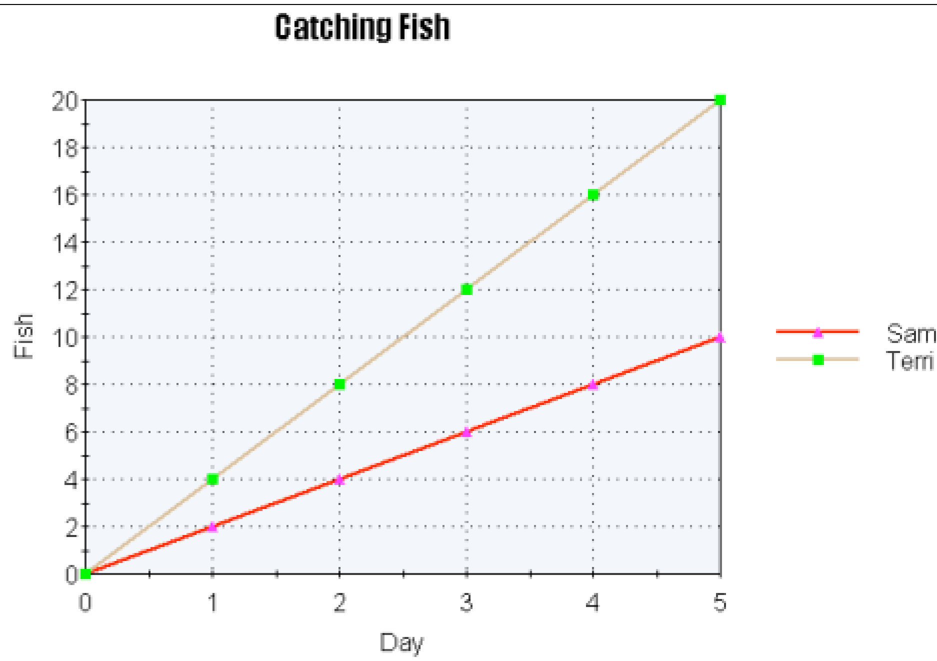
Example:

Describe the pattern: Since Terri catches 4 fish each day, and Sam catches 2 fish, the amount of Terri's fish is always greater. Terri's fish is also always twice as much as Sam's fish. Today, both Sam and Terri have no fish. They both go fishing each day. Sam catches 2 fish each day. Terri catches 4 fish each day. How many fish do they have after each of the five days? Make a graph of the number of fish.

Plot the points on a coordinate plane and make a line graph, and then interpret the graph.

Student:

My graph shows that Terri always has more fish than Sam. Terri's fish increases at a higher rate since she catches 4 fish every day. Sam only catches 2 fish every day, so his number of fish increases at a smaller rate than Terri. Important to note as well that the lines become increasingly further apart. Identify apparent relationships between corresponding terms. Additional relationships: The two lines will never intersect; there will not be a day in which boys have the same total of fish, explain the relationship between the number of days that has passed and the number of fish a boy has (2n or 4n, n being the number of days).



Example:

Use the rule “add 3” to write a sequence of numbers. Starting with a 0, students write 0, 3, 6, 9, 12, . . .

Use the rule “add 6” to write a sequence of numbers. Starting with 0, students write 0, 6, 12, 18, 24, . . .

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

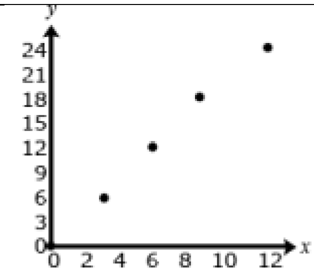
0, $^{+3}$ 3, $^{+3}$ 6, $^{+3}$ 9, $^{+3}$12, . . .

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

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

Ordered pairs

(0, 0) (3,6) (6,12) (9,18)



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.

Students extend their understanding of the base-ten system to the relationship between adjacent places, how numbers compare, and how numbers round for decimals to thousandths. This standard calls for students to reason about the magnitude of numbers. Students should work with the idea that the tens place is ten times as much as the ones place, and the ones place is 1/10th the size of the tens place.

In fourth grade, students examined the relationships of the digits in numbers for whole numbers only. This standard extends this understanding to the relationship of decimal fractions. Students use base ten blocks, pictures of base ten blocks, and interactive images of base ten blocks to manipulate and investigate the place value relationships. They use their understanding of unit fractions to compare decimal places and fractional language to describe those comparisons.

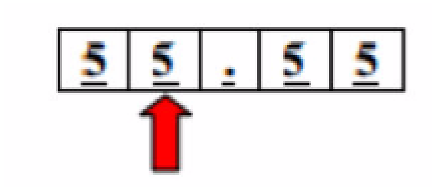
Before considering the relationship of decimal fractions, students express their understanding that in multi-digit whole numbers, a digit in one place represents 10 times what it represents in the place to its right and 1/10 of what it represents in the place to its left.

Example: The 2 in the number 542 is different from the value of the 2 in 324. The 2 in 542 represents 2 ones or 2, while the 2 in 324 represents 2 tens or 20. Since the 2 in 324 is one place to the left of the 2 in 542 the value of the 2 is 10 times greater. Meanwhile, the 4 in 542 represents 4 tens or 40 and the 4 in 324 represents 4 ones or 4. Since the 4 n 324 is one place to the right of the 4 in 542 the value of the 4 in the number 324 is 1/10th of its value in the number 542.

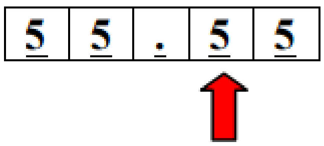
Example: A student thinks, "I know that in the number 5555, the 5 in the tens place (5555) represents 50 and the 5 in the hundreds place (5555) represents 500. So a 5 in the hundreds place is ten times as much as a 5 in the tens place or a 5 in the tens place is 1/10 of the value of a 5 in the hundreds place. Base on the base-10 number system digits to the left are times as great as digits to the right; likewise, digits to the right are 1/10th of digits to the left. For example, the 8 in 845 has a value of 800 which is ten times as much as the 8 in the number 782. In the same spirit, the 8 in 782 is 1/10th the value of the 8 in 845.

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

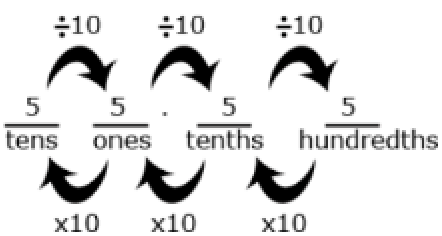
In the number 55.55, each digit is 5, but the value of the digits is different because of the placement.



The 5 that the arrow points to is 1/10 of the 5 to the left and 10 times the 5 to the right. The 5 in the ones place is 1/10 of 50 and 10 times five tenths.



The 5 that the arrow points to is 1/10 of the 5 to the left and 10 times the 5 to the right. The 5 in the tenths place is 10 times five hundredths.



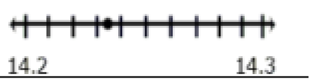
5.NBT.3a	Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g.: 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 x (1/100) + 2 x (1/1000)

This standard references expanded form of decimals with fractions included. Students should build on their work from Fourth Grade, where they worked with both decimals and fractions interchangeably. Expanded form is included to build upon work in 5.NBT.2 and deepen students’ understanding of place value. Students build on the understanding they developed in fourth grade to read, write, and compare decimals to thousandths. They connect their prior experiences with using decimal notation for fractions and addition of fractions with denominators of 10 and 100. They use concrete models and number lines to extend this understanding to decimals to the thousandths. Models may include base ten blocks, place value charts, grids, pictures, drawings, manipulatives, technology-based, etc. They read decimals using fractional language and write decimals in fractional form, as well as in expanded notation. This investigation leads them to understanding equivalence of decimals (0.8 = 0.80 = 0.800).

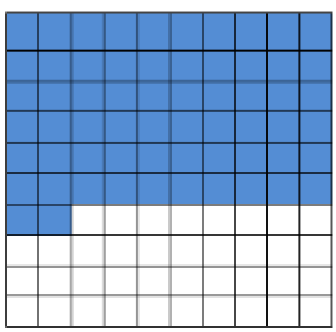
5.NBT.4	Use place value understanding to round decimals to any place.

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

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



Students should use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0., 0.5, 1, 1.5 are examples of benchmark numbers. Example: Which benchmark number is the best estimate of the shaded amount in the model below? Explain your thinking.



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

This standard builds on the work from fourth grade where students are introduced to decimals and compare them. In fifth grade, students begin adding, subtracting, multiplying and dividing decimals. This work should focus on concrete models and pictorial representations, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25 x 3= 6.75), but this work should not be done without models or pictures. This standard includes students' reasoning and explanations of how they use models, pictures, and strategies.

Expectations for decimals are limited to thousandths and expectations for factors are limited to hundredths at this grade level so students will multiply tenths with tenths and tenths with hundredths, but they need not multiply hundredths with hundredths.

Addition:

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

Example: 3.6 + 1.7

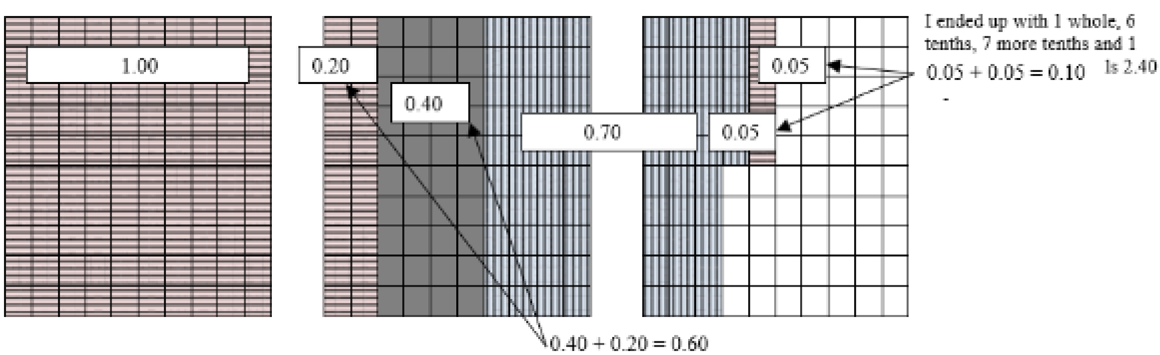
A student might estimate the sum to be larger than 5 because 3.6 is more than 3 ½ and 1.7 is more than 1 ½.

Example: A recipe for a cake requires 1.25 cups of milk, 0.40 cups of oil, and 0.75 cups of water. How much liquid is in the mixing bowl?

Student 1

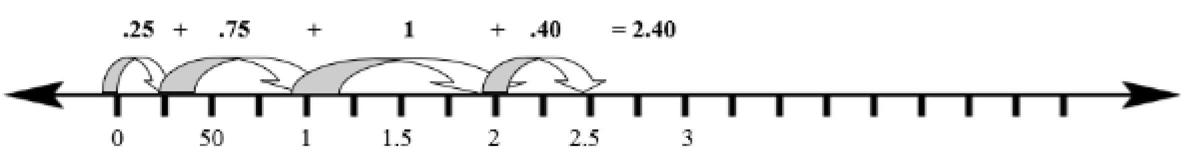
1.25 + 0.40 + 0.75

First, I broke the numbers apart: I broke 1.25 into 1.00 + 0.20 + 0.05 I left 0.40 like it was. I broke 0.75 into 0.70 + 0.05 I combined my two 0.05s to get 0.10. I combined 0.40 and 0.20 to get 0.60. I added the 1 whole from 1.25.



Student 2

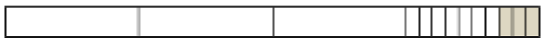
I saw that the 0.25 in 1.25 and the 0.75 for water would combine to equal 1 whole. I then added the 2 wholes and the 0.40 to get 2.40.



Subtraction:

Example: 4 - 0.3

3 tenths subtracted from 4 wholes. The wholes must be divided into tenths. (solution is 3 and 7/10 or 3.7)



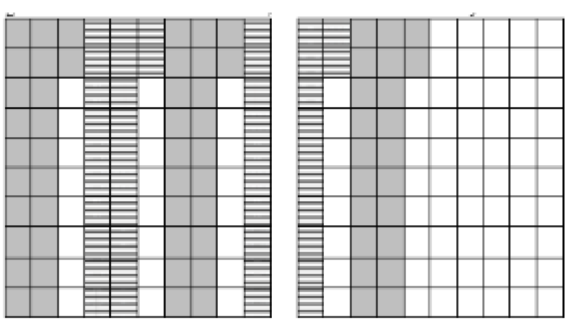
Multiplication:

There are several lines of reasoning that students can use to explain the placement of the decimal point in other products of decimals. Students can think about the product of the smallest base-ten units of each factor. For example, a tenth times a tenth is a hundredth, so 3.2 x 7.1 will have an entry in the hundredth place. Students can also think of the decimals as fractions or as whole numbers divided by 10 or 100. Students can also reason that when they carry out the multiplication without the decimal point, they have multiplied each decimal factor by 10 or 100, so they will need to divide by those numbers in the end to get the correct answer. Also, students can use reasoning about the sizes of numbers to determine the placement of the decimal point. This estimation-based method is not reliable in all cases, however, especially in cases students will encounter in later grades. For example, it is not easy to decide where to place the decimal point in 0.023 x 0.0045 based on estimation. Students can summarize the results of their reasoning such as those above as specific numerical patterns and then as one general overall pattern such as “the number of decimal places in the product is the sum of the number of decimal places in each factor.”

• 6 x 2.4

A student might estimate an answer between 12 and 18 since 6 x 2 is 12 and 6 x 3 is 18. Another student might give an estimate of a little less than 15 because s/he figures the answer to be very close, but smaller than 6 x 2 ½ and think of 2 ½ groups of 6 as 12 (2 groups of 6) + 3 (½ of a group of 6).

Example of Multiplication: A gumball costs $0.22. How much do 5 gumballs cost? Estimate the total, and then calculate. Was your estimate close?

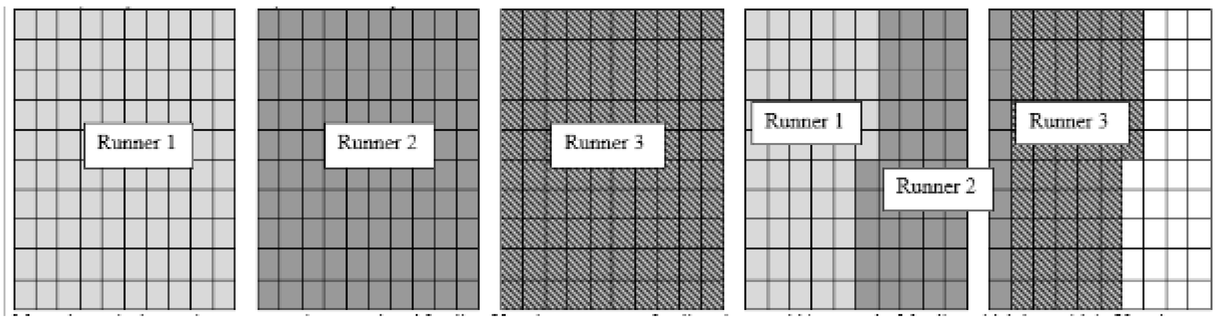


I estimate that the total cost will be a little more than a dollar. I know that 5 20’s equal 100 and we have 5 22’s. I have 10 whole columns shaded and 10 individual boxes shaded. The 10 columns equal 1 whole. The 10 individual boxes equal 10 hundredths or 1 tenth. My answer is $1.10. My estimate was a little more than a dollar, and my answer was $1.10. I was really close.

Division:

General methods used for computing quotients of whole numbers extend to decimals with the additional issue of placing the decimal point in the quotient. As with decimal multiplication, students can first examine the cases of dividing by 0.1 and 0.01 to see that the quotient becomes 10 times or 100 times as large as the dividend. As with decimal multiplication, students can then proceed to more general cases. Dividing by a decimal less than 1 results in a quotient larger than the dividend and moves the digits of the dividend one place to the left. Students can summarize the results of their reasoning as specific numerical patterns then as one general overall pattern such as "when the decimal point in the divisor is moved to make a whole number, the decimal point in the dividend should be moved the same number of places."(Progressions for the CCSSM, Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 17-18)

Example of Division: A relay race lasts 4.65 miles. The relay team has 3 runners. If each runner goes the same distance, how far does each team member run? Make an estimate, find your actual answer, and then compare them.



My estimate is that each runner runs between 1 and 2 miles. If each runner went 2 miles, that would be a total of 6 miles which is too high. If each runner ran 1 mile, that would be 3 miles, which is too low. I used the 5 grids above to represent the 4.65 miles. I am going to use all of the first 4 grids and 65 of the squares in the 5th grid. I have to divide the 4 whole grids and the 65 squares into 3 equal groups. I labeled each of the first 3 grids for each runner, so I know that each team member ran at least 1 mile. I then have 1 whole grid and 65 squares to divide up. Each column represents one-tenth. If I give 5 columns to each runner, that means that each runner has run 1 whole mile and 5 tenths of a mile. Now, I have 15 squares left to divide up. Each runner gets 5 of those squares. So each runner ran 1 mile, 5 tenths and 5 hundredths of a mile. I can write that as 1.55 miles.

My answer is 1.55 and my estimate was between 1 and 2 miles. I was pretty close.

M : Major Content S: Supporting Content A : Additional Content

21st Century Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

MIF Lesson Structure

	LESSON STRUCTURE	RESOURCES	COMMENTS
PRE TEST	**Chapter Opener** Assessing Prior Knowledge *The Pre Test serves as a diagnostic test of readiness of the upcoming chapter*	**Teacher Materials** Quick Check Pretest (Assessm't Bk) Recall Prior Knowledge **Student Materials** Student Book (Quick Check); Copy of the Pre Test; Recall prior Knowledge	Recall Prior Knowledge (RPK) can take place just before the pre-tests are given and can take 1-2 days to front load prerequisite understanding Quick Check can be done in concert with the RPK and used to repair student misunderstandings and vocabulary prior to the pre-test ; Students write Quick Check answers on a separate sheet of paper Quick Check and the Pre Test can be done in the same block *(See Anecdotal Checklist; Transition Guide)* Recall Prior Knowledge – Quick Check – Pre Test
DIRECT ENGAGEMENT	**Direct Involvement/Engagement** Teach/Learn *Students are directly involved in making sense, themselves, of the concepts – by interacting the tools, manipulatives, each other, and the questions*	**Teacher Edition** 5-minute warm up Teach; Anchor Task **Technology** Digi **Other** Fluency Practice	• The Warm Up activates prior knowledge for each new lesson • Student Books are CLOSED; Big Book is used in Gr. K • Teacher led; Whole group • Students use concrete manipulatives to explore concepts • A few select parts of the task are explicitly shown, but the majority is addressed through the hands-on, constructivist approach and questioning • Teacher facilitates; Students find the solution
GUIDED LEARNING	**Guided Learning and Practice** Guided Learning	**Teacher Edition** Learn **Technology** Digi **Student Book** Guided Learning Pages Hands-on Activity	Students-already in pairs /small, homogenous ability groups; Teacher circulates between groups; Teacher, anecdotally, captures student thinking **Small Group w/Teacher circulating among groups** Revisit Concrete and Model Drawing; Reteach Teacher spends majority of time with struggling learners; some time with on level, and less time with advanced groups Games and Activities can be done at this time

INDEPENDENT PRACTICE	**Independent Practice** *A formal formative assessment*	**Teacher Edition** Let's Practice **Student Book** Let's Practice **Differentiation Options** All: Workbook Extra Support: Reteach On Level: Extra Practice Advanced: Enrichment	**Let's Practice** determines readiness for Workbook and small group work and is used as formative assessment; Students not ready for the Workbook will use Reteach. The Workbook is continued as Independent Practice. Manipulatives **CAN** be used as a communications tool as needed. Completely Independent On level/advance learners should finish all workbook pages.
ADDITIONAL PRACTICE	**Extending the Lesson**	Math Journal Problem of the Lesson Interactivities Games	
	Lesson Wrap Up	Problem of the Lesson Homework (Workbook , Reteach, or Extra Practice)	Workbook or Extra Practice Homework is only assigned when students fully understand the concepts (as additional practice) Reteach Homework (issued to struggling learners) should be checked the next day
POST TEST	**End of Chapter Wrap Up and Post Test**	**Teacher Edition** Chapter Review/Test Put on Your Thinking Cap **Student Workbook** Put on Your Thinking Cap **Assessment Book** Test Prep	Use Chapter Review/Test as "review" for the End of Chapter Test Prep. Put on your Thinking Cap prepares students for novel questions on the Test Prep; Test Prep is graded/scored. The Chapter Review/Test can be completed • Individually (e.g. for homework) then reviewed in class • As a 'mock test' done in class and doesn't count • As a formal, in class review where teacher walks students through the questions Test Prep is completely independent; scored/graded Put on Your Thinking Cap (green border) serve as a capstone problem and are done just before the Test Prep and should be treated as Direct Engagement. By February, students should be doing the Put on Your Thinking Cap problems on their own.

TRANSITION LESSON STRUCTURE (No more than 2 days)

- **Driven by Pre-test results, Transition Guide**
- **Looks different from the typical daily lesson**

Transition Lesson – Day 1 **Objective:**	
CPA Strategy/Materials	**Ability Groupings/Pairs (by Name)**
Task(s)/Text Resources	**Activity/Description**

Pacing Guide

Activity	NJSLS	Estimated Time	Lesson Notes
Review Modules		Unit 2	5.NF.1-2 5.NF.3 Use as needed
Pre-Test 4	4.OA.3, 4.OA.4, 4.NF.1, 4.NF.6, 5.NF.1, 5.NF.2 5.NF.3, 5.NF.4.a	1/2 block	
Chapter 4 Opener/Recall Prior Knowledge	4.NF.1, 5.NF.1, 5.NF.4	1 block	
4.1 Multiplying Proper Fractions	5.NF.4.a, 5.NF.4.b	1 blocks	*Multiply proper fractions
Mini Assessment #3	5.NF.3	½ block	
Review		1 block	*Review/Reteach concepts that need to be readdressed
4.2 Real-World Problems: Multiplying with Proper Fractions	5.NF.4.a, 5.NF.6	1 block	*Solve real world problems involving multiplication of proper fractions
Authentic Assessment #5	5.NF.1, 5.NF.2	½ block	
4.3 Multiplying Improper Fractions by Fractions	5.NF.4.a, 5.NF.4.b	1 block	*Multiply improper fractions by proper fractions
Module 5.NF.4			Review as needed Module
Mini Assessment #4	5.NF.4.a, 5.NF.4.b	½ block	
Review		1 block	*Review/Reteach concepts that need to be readdressed
4.4 Multiplying Mixed Numbers and Whole Numbers	5.NF.5.a, 5.NF.5.b, 5.NF.6	1 blocks	*Multiply a mixed number by a whole number *Compare the size of a product to the size of its factors
Authentic Assessment #6	5.NF.5.a, 5.NF.5.b	½ block	
4.5 Real-World Problems: Multiplying with Mixed Numbers	5.NF.4.a, 5.NF.6	1 block	*Solve real world problems involving multiplication of whole numbers and mixed numbers
6.1 Finding the Area of a Rectangle with Fractional Side Lengths	5.NF.4.b	1 block	
Mini Assessment #5	5.NF.5, 5.NF.6	½ block	
Review		1 block	*Review/Reteach concepts that need to be readdressed
4.6 Dividing Fractions and Whole Numbers	5.NF.7.a, 5.NF.7.b, 5.NF.7.c	1 block	*Divide a fraction by a whole number *Divide a fraction by a unit fraction

4.7 Real-World Problems: Multiplying and Dividing with Fractions	5.NF.6, 5.NF.7.a, 5.NF.7.c	2 block	*Solve real world problems involving multiplication and division of fractions and whole numbers
Chapter 4 Wrap Up/Review		1 block	*Reinforce and consolidate chapter skills and concepts
Chapter 4 Test-Review w/TP	5.NF.4a, 5.NF.4b, 5.NF.7.a, 5.NF.7.c	1/2 block	
Authentic Assessment #7	5.NF.7	½ block	
Mini Assessment #6	5.NF.7	½ block	
Review		1 block	*Review/Reteach concepts that need to be readdressed
Pre Test 5	2.OA.1, 3.OA.1, 3.OA.4, 3.OA.8, 4.OA.1	1/2 block	
Review		1 block	Review/Reteach concepts that need to be readdressed
Chapter 5 Opener/Recall Prior Knowledge	4.OA.5, 3.OA.5, 5.OA.1	1/2 block	
5.1 Number Patterns and Relationships	5.OA.1	1 blocks	*Identify and extend number patterns *Identify the relationships between two sets of numbers
5.2 Using Letters as Numbers	5.OA.3	2 block	*Recognize, write and evaluate simple algebraic expressions in one variable
5.3 Simplifying Algebraic Expressions	OMIT	OMIT	
5.4 Inequalities and Equations	OMIT	OMIT	
5.5 Real-World Problems: Algebra	OMIT	OMIT	
Chapter 5 Wrap Up/Review		½ block	*Reinforce and consolidate chapter skills and concepts
Chapter 5 Test-Review no TP	4.OA.5, 5.OA.3	½ block	
Pre-Test 8	3.NBT.3.b, 4.NBT.6, 5.NBT.3.a, 5.NBT.3.b, 5.NBT.4, 5.NBT.7	½ block	
Chapter 8 Opener/Recall Prior Knowledge	5.NBT.3, 5.NBT.4	1 block	
8.1 Understanding Thousandths	5.NBT.1, 5.NBT.3.a, 5.NBT.7	2 blocks	* Remind students that they need the zeros to ensure that the remaining digits are in the correct place.
8.2 Comparing and	5.NBT.1,	1 block	* Have students write the whole numbers the decimal is between, then the two tenths, and

Rounding Decimals	5.NBT.3.b, 5.NBT.4		lastly the two hundredths. For example, students decide if 1.799 is nearer to 1 or 2, then 1.7 or 1.8, and lastly 1.79 or 1.80.
8.3 Rewriting Decimals as Fractions and Mixed Numbers	5.NBT.1, 5.NBT.3.a	1 block	* Remind students to count every digit after the decimal point, including zeros, when determining the denominator.
Chapter 8 Wrap Up/Review		1 block	*Reinforce and consolidate chapter skills and concepts.
Chapter 8 Test-Review w/TP	4.NF.6, 5.NBT.3, 5.NBT.3.a, 5.NBT.4, 5.MD.1	½ block	
Mini Assessment #7	5.NBT.1, 5.NBT.2, 5.NBT.3, 5.NBT.4	½ block	
Review		1 block	*Review/Reteach concepts that need to be readdressed
Authentic Assessment #8 (optional)	5.NF.5.a, 5.NF.5.b	½ block	

Resources for Special Needs and English Language Learners

Chapter 4

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- draw pictures to illustrate vocabulary terms
- answer yes/no questions about terms and definitions
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that use earlier stages of the Concrete-Pictorial-Abstract spectrum, such as having students

- use manipulatives such as fraction strips to model multiplication and division of fractions by whole numbers
- draw pictures to illustrate multiplication of fractions and division of fractions by a whole number
- create and solve fraction and mixed number multiplication word problems using those in the chapter as models
- use their own words to explain different methods they learn throughout the chapter

See also pages 182A, 185, and 190.

If necessary, review:

- Chapter 2 (Whole Number Multiplication and Division)
- Chapter 3 (Fractions and Mixed Numbers)

For Advanced Learners

See suggestions on pages 173 and 185.

Chapter 5

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- draw pictures to illustrate vocabulary terms
- restate the meanings of vocabulary words using their own words
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- use manipulatives such as algebra tiles to model solving simple addition and subtraction equations
- draw pictures of expressions before simplifying them in Lesson 5.3
- give and follow verbal directions for solving specific equations step-by-step
- use their own words to explain different methods they learn throughout the chapter and tell which they prefer and why

See also page 246–247.

If necessary, review

- Chapter 1 (Whole Numbers) or
- Chapter 2 (Whole Number Multiplication and Division)

For Advanced Learners

See suggestion on page 244–245.

Chapter 6

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the Word Wall
- measure angles and sides of real-world triangles, classify the triangles, and find the area
- make and practice with flash cards that include words on one side and pictures and definitions on the other side
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- use a drawing triangle to draw the heights of triangles
- find the areas of triangles on grid paper
- prove the triangle area formula by cutting a rectangular piece of paper along the diagonal and comparing the areas of the pieces
- measure the same triangle using different units and compare the areas

See also pages 267A and 280–281.

If necessary, review Chapter 2 (Whole Number Multiplication and Division)

Chapter 8

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- share real-world experiences with decimals, such as with measurement, sports, and money
- use models, pictures, and/or numbers to show the difference between 1 ten and 1 tenth, 1 hundred and 1 hundredth, and 1 thousand and 1 thousandth
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- use manipulatives such as base-ten blocks and place-value charts to model decimals
- write decimals that fall between two specific decimals, such as 2.103 and 2.115
- make three different decimals in thousandths using the digits 0, 2, 4, and 5 and show the decimals on a number line
- write the equivalent of 1 tenth in terms of hundredths and thousandths using words and fractions (1 tenth = 10 hundredths = 100 thousandths; $\frac{1}{10} = \frac{10}{100} = \frac{100}{1000}$)

See also pages 9–10 and 16–17.

If necessary, review

- Chapter 3 (Fractions and Mixed Numbers)
- Grade 4 Chapter 7 (Decimals)

For Advanced Learners

See suggestions on pages 11 and 19.

Pacing Calendar

Please complete the pacing calendar based on the suggested pacing.

NOVEMBER						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
			1	**2**	**3**	**4**
5	**6**	**7**	**8**	***9***	**10**	**11**
12	**13**	**14**	**15**	**16**	**17**	**18**
19	**20**	**21**	**22**	**23**	**24**	**25**
26	**27**	**28**	**29**	**30**		

DECEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 / 31	25	26	27	28	29	30

JANUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	**2**	***3***	**4**	**5**	**6**
7	**8**	**9**	**10**	**11**	**12**	**13**
14	**15**	**16**	**17**	**18**	**19**	**20**
21	**22**	**23**	**24**	**25**	**26**	**27**
28	**29**	**30**	**31**			

Unit 2 Math Background

Chapter 4: Multiplying and Dividing Fractions and Mixed Numbers

In Grade 2, students learned to add and subtract unit fractions. In Grades 3 and 4, students learned various fraction concepts, such as finding equivalent fractions, simplifying fractions, adding and subtracting like and unlike fractions, multiplying fractions by whole numbers; and renaming fractions as decimals and mixed numbers. Students are also familiar with the unitary method and how to draw a model to show what is stated. In Grade 5, Chapter 2 students learned to simplify expressions using the order of operations.

Chapter 5: Algebra

In Grades 2 and 3, students learned to compare numbers using symbolic notation and use number properties. In Chapter 2, they learned to simplify numerical expressions using the order of operations. Use pages 217 and 218 to review the prerequisite skills and concepts relating to numbers and operations.

In this chapter, students learn to write both numerical and algebraic expressions and equations to represent given situations. They also learn to simplify and evaluate expressions, inequalities, and equations to solve real-world problems. They learn that variables represent numbers with exact values that are not specified. They then solve simple equations by using number sense, properties of operations, and the idea of maintaining equality on both sides of an equation.

Chapter 8: Decimals

In Grade 4, students learned to express tenths and hundredths as decimals and fractions. They also learned to compare and round decimals.

In this chapter, students are introduced to the place value of decimals through thousandths. In the process, they learn how to read and write decimals through thousandths, identify the relationship between fractions and decimals, compare and order decimals, and round decimals to the nearest hundredth.

Transition Guide References:

Chapter 4: Multiplying and Dividing Fractions and Mixed Numbers				
Transition Topic: Number and Operations: Fractions				
Grade 5 Chapter 4 Pre Test Items	**Grade 5 Chapter 4 Pre-Test Item Objective**	**Additional Support for the Objective: Grade 4 Reteach**	**Additional Support for the Objective: Grade 4 Extra Practice**	**Grade 4 Teacher Edition Support**
Items 1, 5–7	Find equivalent fractions.	Support for this objective is included in Chapter 6.		4A Chapter 6 Lesson 2
Chapter 4 Item 2	Write an improper fraction for a model.	Support for this objective is included in Chapter 6.		4A Chapter 6 Lesson 4
Chapter 4 Items 3, 11	Express a fraction as a decimal and a decimal as a fraction.	Support for this objective is included in Chapter 6.		4B Chapter 7 Lessons 1 and 2
Chapter 4 Item 8	Subtract unlike fractions.	Support for this objective is included in Chapter 6.		4A Chapter 6 Lesson 2
Chapter 4 Items 9–10	Express improper fractions as mixed numbers, and mixed numbers as improper fractions.	Support for this objective is included in Chapter 6.		4A Chapter 6 Lesson 4
Chapter 4 Item 12	Find a fractional part of a number.	4A pp. 193–198	Lesson 6.7	4A Chapter 6 Lesson 8
Chapter 4 Item 14, 16	Solve real–world problems involving fractions.	4A pp. 199–206	Lesson 6.8	4A Chapter 6 Lesson 8
Chapter 4 Items 15, 17	Use a variety of strategies to solve word problems involving all four operations.	Support for this objective is included in Chapter 6.		4A Chapter 6 Lesson 8 (no division)

Chapter 8: Decimals				
Transition Topic: Money and decimals				
Grade 5 Chapter 8 Pre Test Items	**Grade 5 Chapter 8 Pre-Test Item Objective**	**Additional Support for the Objective: Grade 4 Reteach**	**Additional Support for the Objective: Grade 4 Extra Practice**	**Grade 4 Teacher Edition Support**
Items 5, 8–9	Compare and order decimals	4B pp. 29–32, 39–46 Lesson 7.3 4B Chapter 8 Lesson 2	Lesson 7.3	4B Chapter 8 Lesson 2
Items 3–4, 12–17	Round decimals to the nearest whole number or tenth.	4B pp. 47–50	Lesson 7.4	4B Chapter 8 Lesson 2
Items 10-11, 18	Express a fraction as a decimal and a decimal as a fraction.	Support for this objective is included in Chapter 3.		4B Chapter 8 Lesson 3
Items1, 7–12, 21	Read and write hundredths in decimal and fractional forms.	4B pp. 11–15, 18–28	Lesson 7.2	4B Chapter 8 Lesson 3
Item 1	Use different methods to multiply whole numbers up to four-digits by one-digit and two-digit numbers with or without regrouping.	Support for this objective is included in Chapter 2.		4A Chapter 2 Lessons 2 and 3 (up to three-digit by two-digit)

PARCC Assessment Evidence/Clarification Statements

NJSLS	Evidence Statement	Clarification	Math Practices
5.OA.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	i) Expressions have depth no greater than two, e.g., 3×[5 + (8 ÷ 2)] is acceptable but 3×[5 + (8 ÷ {4−2})] is not.	MP.7
5.OA.2-1	Write simple expressions that record calculations with numbers. For example, express the calculation “add 8 and 7, then multiply by 2” as 2 x (8 + 7).		MP.7
5.OA.2-2	Interpret numerical expressions without evaluating them. For example, recognize that 3 x (18932 + 921) is three times as large as 18932 + 921 without having to calculate the indicated sum or product.		MP.7
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. For example, given the rule “Add 3” and the starting number 0, and given the rule “Add 6” and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.		MP.3, MP.8
5.NF.1-1	Add two fractions with unlike denominators, or subtract two fractions with unlike denominators, by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad+bc)/bd.)	i) Tasks have no context. ii) Tasks ask for the answer or ask for an intermediate step that shows evidence of using equivalent fractions as a strategy. iii) Tasks do not include mixed numbers. iv) Tasks may involve fractions greater than 1 (including fractions equal to whole numbers). v) Prompts do not provide visual fraction models; students may at their discretion	MP.6, MP.7

		draw visual fraction models as a strategy.	
5.NF.1-2	Add three fractions with no two denominators equal by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum of fractions with like denominators. For example, 1/2 + 1/3 + 1/4 = (3/6 + 2/6) + 1/4 = 5/6 + 1/4 = 10/12 + 3/12 = 13/12 or alternatively 1/2 + 1/3 + 1/4 = 6/12 + 4/12 + 3/12 = 13/12.	i) Tasks have no context. ii) Tasks ask for the answer or ask for an intermediate step that shows evidence of using equivalent fractions as a strategy. iii) Tasks do not include mixed numbers. iv) Tasks may involve fractions greater than 1 (including fractions equal to whole numbers). v) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy.	MP.6, MP.7
5.NF.1-3	Compute the result of adding two fractions and subtracting a third, where no two denominators are equal, by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 1/2 + 1/3 – 1/4 or 7/8 – 1/3 + 1/2.	i) Tasks have no context. ii) Tasks ask for the answer or ask for an intermediate step that shows evidence of using equivalent fractions as a strategy. iii) Subtraction may be either the first or second operation. The fraction being subtracted must be less than both the other two. iv) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy.	
5.NF.1-4	Add two mixed numbers with unlike denominators, expressing the result as a mixed number, by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum with like denominators. For example, 3 1/2 + 2 2/3 = (3 + 2) + (1/2 + 2/3) = 5 + (3/6 + 4/6) = 5 + 7/6 = 5 + 1 + 1/6 = 6 1/6.	i) Tasks have no context. ii) Tasks ask for the answer or ask for an intermediate step that shows evidence of using equivalent fractions as a strategy. iii) Subtraction may be either the first or second operation. The fraction being subtracted must be less than both the other two. iv) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy	MP.6, MP.7
5.NF.1-5	Subtract two mixed numbers with unlike denominators, expressing the result as a mixed number, by replacing given fractions with equivalent fractions in such a way as to produce an equivalent difference with like denominators.	i) Tasks have no context. ii) Tasks ask for the answer or ask for an intermediate step that shows evidence of using equivalent fractions as a strategy. iii) Subtraction may be either the first or second operation. The fraction being subtracted must be less than both the other two.	MP.6, MP.7
5.NF.4a-1	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. For a whole number q, interpret the product (a/b) × q as a parts	i) Tasks require finding a fractional part of a whole number quantity. ii) The result is equal to a whole number in 20% of tasks; these are practice-forward for MP.7.	MP.7

	of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)	iii) Tasks have "thin context" or no context.	
5.NF.4a-2	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. For a fraction q, interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.	i) Tasks have "thin context" or no context. ii) Tasks require finding a product of two fractions (neither of the factors equal to a whole number). iii) The result is equal to a whole number in 20% of tasks; these are practice-forward for MP.7.	MP.7
5.NF.4b-1	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. b. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas	i) 50% of the tasks present students with the rectangle dimensions and ask students to find the area; 50% of the tasks give the factions and the product and ask students to show a rectangle to model the problem	MP.2, MP.5
5.NF.5a	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	i) Insofar as possible, tasks are designed to be completed without performing the indicated multiplication. ii) Products involve at least one factor that is a fraction or mixed number.	MP.7, MP.8
5.NF.6-1	Solve real world problems involving multiplication of fractions, e.g., by using visual fraction models or equations to represent the problem.	i) Tasks do not involve mixed numbers. ii) Situations include area and comparison/times as much, with product unknown. (See Table 2, Common multiplication and division situations, p. 89 of CCSS.) iii) Prompts do not provide visual fraction models; students may, at their discretion, draw visual fraction models as a strategy.	MP.1, MP.4, MP.5
5.NF.6-2	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the	i) Tasks present one or both factors in the form of a mixed number. ii) Situations include area and comparison/times as much, with	MP.1, MP.2, MP.5

	problem.	product unknown. iii) Prompts do not provide visual fraction models; students may, at their discretion, draw visual fraction models as a strategy.	
5.NF.7a	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.		MP.5, MP.7
5.NF.7b	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.		MP.5, MP.7
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.	i) Tasks have “thin context”1 or no context. ii) Tasks involve the decimal point in a substantial way (e.g., by involving a comparison of a tenths digit to a thousandths digit or a tenths digit to a tens digit).	MP.2,MP.7
5.NBT.3a	Read, write and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000)	i) Tasks have “thin context” or no context. ii) Tasks assess conceptual understanding, e.g., by including a mixture (both within and between items) of expanded form, number names, and base ten numerals.	MP.7
5.NBT.4	Use place value understanding to round decimals to any place.	i) Tasks have “thin context” or no context.	MP.2
5.NBT.7-1	Add two decimals to hundredths, using concrete models or drawings and	i) Tasks do not have a context. ii) Only the sum is required; explanations	MP.5

	strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	are not assessed here. iii) Prompts may include visual models, but prompts must also present the addends as numbers, and the answer sought is a number, not a picture. iv) Each addend is greater than or equal to 0.01 and less than or equal to 99.99. v) 20% of cases involve a whole number—either the sum is a whole number, or else one of the addends is a whole number presented without a decimal point. (The addends cannot both be whole numbers.)	
5.NBT.7-2	Subtract two decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. i	i) Tasks do not have a context. ii) Only the difference is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the subtrahend and minuend as numbers, and the answer sought is a number, not a picture. iii) The subtrahend and minuend are each greater than or equal to 0.01 and less than or equal to 99.99. Positive differences only. (Every included subtraction problem is an unknown-addend problem included in 5.NBT.7-1.) iv) 20% of cases involve a whole number—either the difference is a whole number, or the subtrahend is a whole number presented without a decimal point, or the minuend is a whole number presented without a decimal point. (The subtrahend and minuend cannot both be whole numbers.)	MP.5, MP. 7
5.NBT.7-3	Multiply tenths with tenths or tenths with hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	i) Tasks do not have a context. ii) Only the product is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the factors as numbers, and the answer sought is a number, not a picture. iii) Each factor is greater than or equal to 0.01 and less than or equal to 99.99. iv) The product must not have any non-zero digits beyond the thousandths place. (For example, 1.67 x 0.34 = 0.5678 is excluded because the product has an 8 beyond the thousandths place; cf. 5.NBT.3, and see p. 17 of the Number and Operations in Base Ten Progression	MP.5, MP. 7

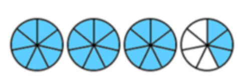
		document.) v) Problems are 2-digit x 2-digit or 1-digit by 3- or 4-digit. (For example, 7.8 x 5.3 or 0.3 x 18.24.) vi) 20% of cases involve a whole number—either the product is a whole number, or else one factor is a whole number presented without a decimal point. (Both factors cannot both be whole numbers.)	
5.NBT.7-4	Divide in problems involving tenths and/or hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	i) Tasks do not have a context. ii) Only the quotient is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the dividend and divisor as numbers, and the answer sought is a number, not a picture. iv) Divisors are of the form XY, X0, X, X.Y, 0.XY, 0.X, or 0.0X (cf. 5.NBT.6), where X and Y represent non-zero digits. Dividends are of the form XY, X0, X, XYZ.W, XY0.Z, X00.Y, XY.Z, X0.Y, X.YZ, X.Y, X.0Y, 0.XY, or 0.0X, where X, Y, Z, and W represent non-zero digits. v) Quotients are either whole numbers or else decimals terminating at the tenths or hundredths place. (Every included division problem is an unknown-factor problem included in 5.NBT.7-3.) vi) 20% of cases involve a whole number—either the quotient is a whole number, or the dividend is a whole number presented without a decimal point, or the divisor is a whole number presented without a decimal point. (If the quotient is a whole number, then neither the divisor nor the dividend can be a whole number.)	MP.5, MP. 7

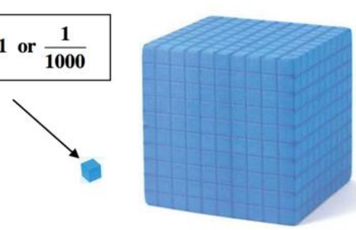
Connections to the Mathematical Practices

1	**Make sense of problems and persevere in solving them** Mathematically proficient students in fifth grade should solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".
2	**Reason abstractly and quantitatively** In fifth grade, students should recognize that a number represents a specific quantity. They connect quantities to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts.
3	**Construct viable arguments and critique the reasoning of others** In fifth grade, mathematically proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.
4	**Model with mathematics** In fifth grade, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.
5	**Use appropriate tools strategically** Mathematically proficient fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real world data.

6	**Attend to precision** Fifth graders should continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.
7	**Look for and make use of structure** Mathematically proficient fifth grade students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.
8	**Look for and express regularity in repeated reasoning** Fifth graders should use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Visual Vocabulary

Visual Definition **The terms below are for teacher reference only and are not to be memorized by students.** Teachers should first present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or use them with words, models, pictures, or numbers.		
CHAPTER 4		
product	 **Sunglasses are \$9.95 a pair.** **\$ 9.95** **x 3** **\$29.85** **product**	The result of multiplication.
common factor	**12 (1, 2, 3, 4, 6, 12)** **18 (1, 2, 3, 6, 9, 18)** **Common Factors of 12 and 18:** **1, 2, 3, 6**	Any common factor of two or more numbers.
proper fraction	 $\frac{5}{8}$ **less than the denominator**	A fraction less than one. In a proper fraction the numerator is less than the denominator.
improper fraction	$\frac{7}{5}$ ← **Greater than (or equal to) denominator**	A fraction where the numerator is greater than or equal to the denominator.
mixed number	**Example:** $3\frac{3}{7}$ 	A number with an integer and a fraction part.

reciprocals	$5 \times \frac{1}{5} = 1$ reciprocals	Two numbers whose product is 1. Also called multiplicative inverses.
CHAPTER 5		
variable	$5 \times b = 10$ b is a variable worth 2	A letter or symbol that represents a number.
numerical expression	$5 + 9$	A mathematical statement including numbers and operations.
evaluate	$42 - 13 = n$ $n = 29$	To find the value of a mathematical expression.
algebraic expression	$3x + 2$	A group of numbers, symbols, and variables that express an operation or a series of operations.
CHAPTER 8		
thousandth	0.001 or $\frac{1}{1000}$ 	One of 1000 equal parts of a whole.

equivalent

$$9 + 12 = 1 + 20$$

Naming the same number.

Potential Student Misconceptions

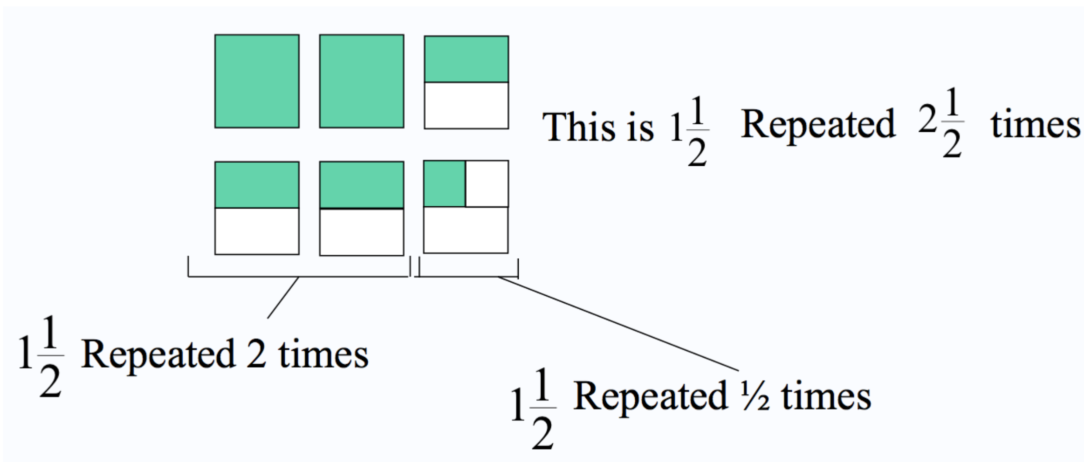
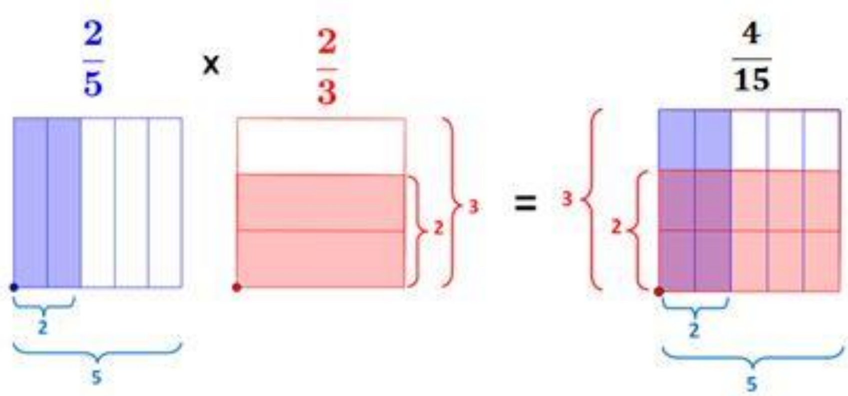
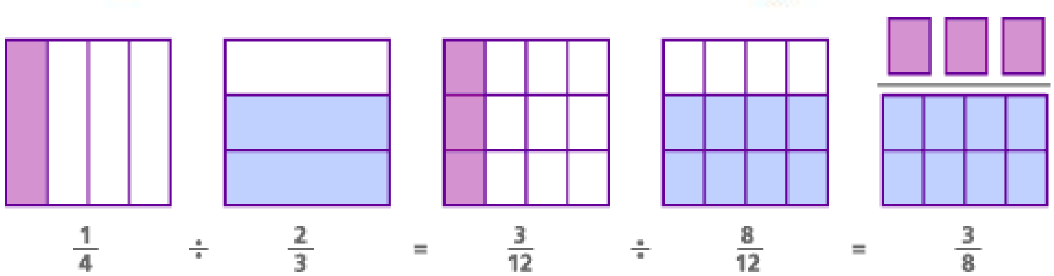
- Chapter 4:
  - Lesson 4.1- Remind students to avoid careless mistakes such as multiplying the wrong numerators or denominators, multiplying incorrectly, or adding rather than multiplying.
  - Lesson 4.2- Students may have difficulty distinguishing between the two types of problems in this lesson. For each problem, have students draw the model taught in the lesson before they solve the problem. For exercises 1 to 3, have students refer to the model on page 176. . For exercises 4 to 7, have students refer to the model on page 178.
  - Lesson 4.3- Some students may have difficulty expressing the product in simplest form. Encourage students to simplify the fractions first when they multiplying greater numbers such as those in exercises 3 to 8. Have them refer to Method 2 on page 182 of the Student Book as necessary.
  - Lesson 4.4- For exercises 3 to 5, some students may multiply the whole numbers first and then write the fraction next to the product rather than change the mixed number to an improper fraction. Have students revisit Method 2 on page 184 to review the correct procedure.
  - Lesson 4.6- When dividing fractions, students may neglect to write the reciprocal of the divisor before they multiply. For each exercise, have students replace the division sign with a multiplication sign, cross out the divisor, and write its reciprocal above it.
  - Lesson 4.7- Some students may confuse the different types of problems presented and the methods for solving them. Have students identify the problem type (find parts of a whole, find fractional parts and wholes given one fractional part, find fractional parts of a remainder given a whole) for each problem. Students can then refer to that part of the lesson as needed.

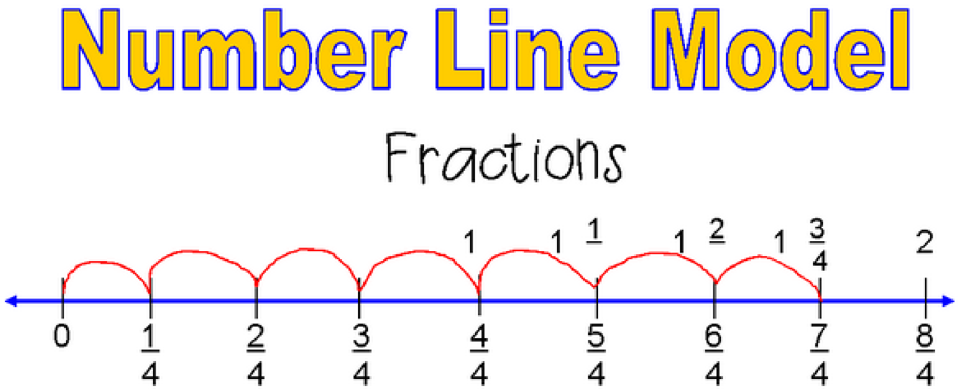
- Chapter 5:
  - Lesson 5.1- Students may not recognize the pattern for Exercises 9 and 10 as being multiples of 6. They may see it simply as adding 6 to the previous number. If they have trouble with 10b, ask them hat length they need to multiply 6 by to get 69.
  - Lesson 5.2- For question 5, some students may write $z+4\div5$ rather than $(z+4)\div5$. Remind students that the expression "z+4" must be contained within parentheses to reflect the order in which the operations had been performed on z to give
    $z + \frac{4}{5}$.

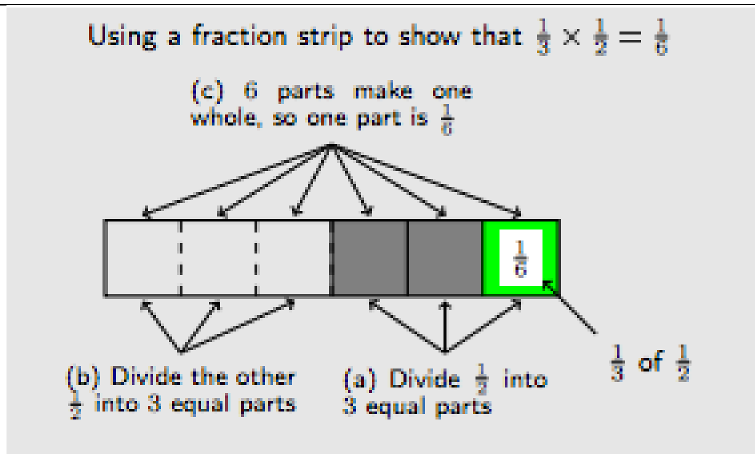
- Chapter 8:
  - Lesson 8.1-Students may omit the placeholder zeros in answers. Remind students that they need the zeros to ensure that the remaining digits are in the correct place.
  - Lesson 8.2- Students may be unable to round numbers to different places. Have students write the whole numbers the decimal is between, then the two tenths, and lastly the two hundredths. For example, students decide if 1.799 is nearer to 1 or 2, then 1.7 or 1.8, and lastly 1.79 or 1.80.
  - Lesson 8.3- Some students may ignore the placeholder zeros in decimals, and then write the wrong denominators when rewriting the decimal as a fraction. Remind students to count every digit after the decimal point, including zeros, when determining the denominator.

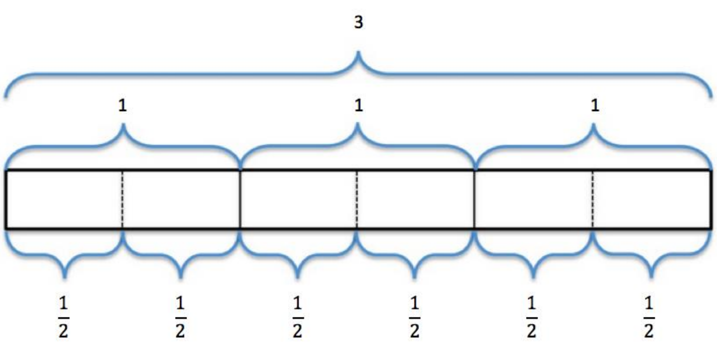
Teaching Multiple Representations

Multiple Representations Framework

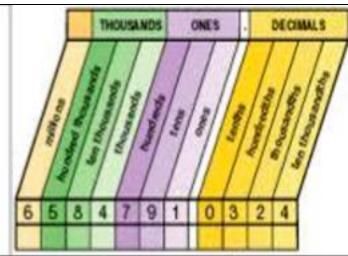
Concrete and Pictorial Representations	
Model	
Area Model	

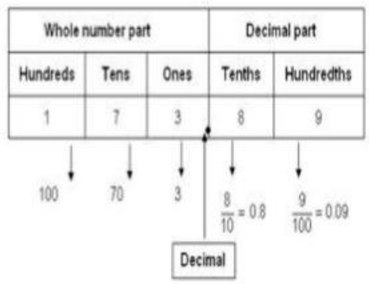
<table>
<tr>
<td>Number Line</td>
<td>


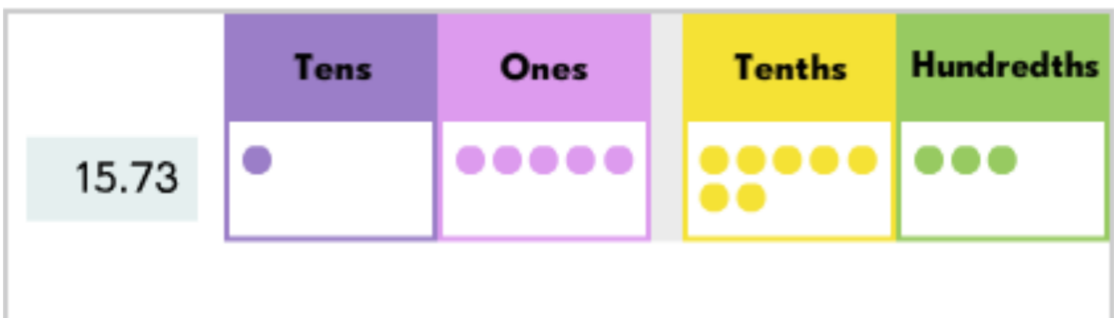
What is 1/4 x 7?
1/4 x 7 = 7/4 or 1 3/4
</td>
</tr>
<tr>
<td>Bar Model/Fraction Strip</td>
<td>


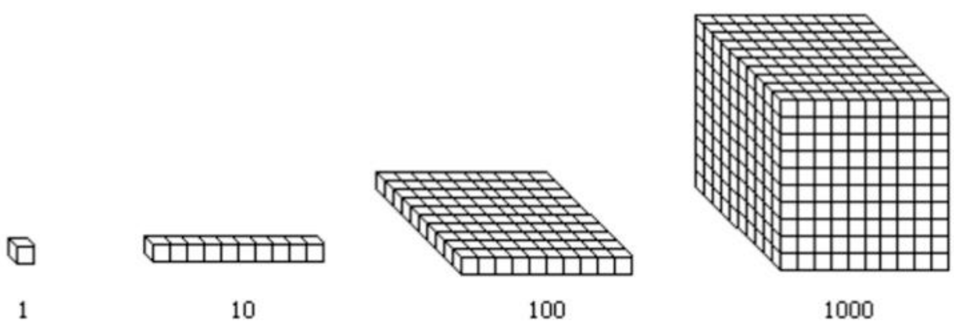


$3 \div \frac{1}{2}$
</td>
</tr>
</table>

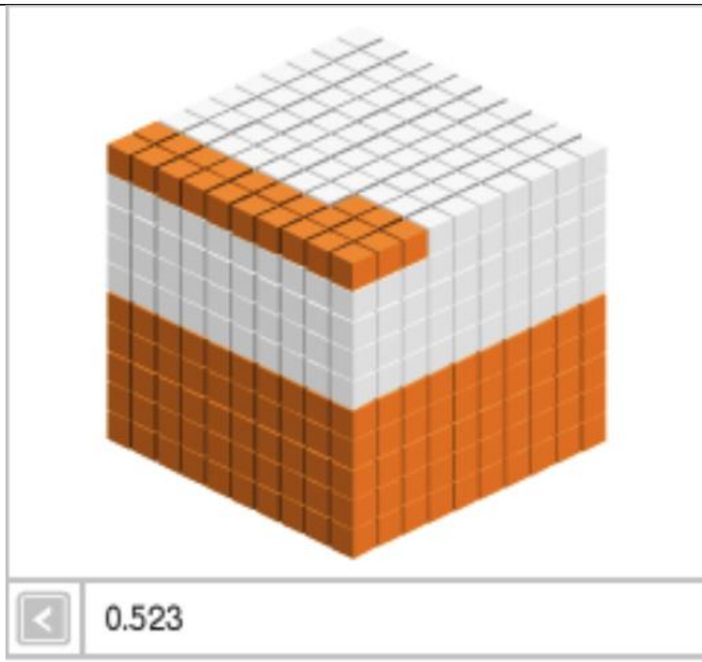
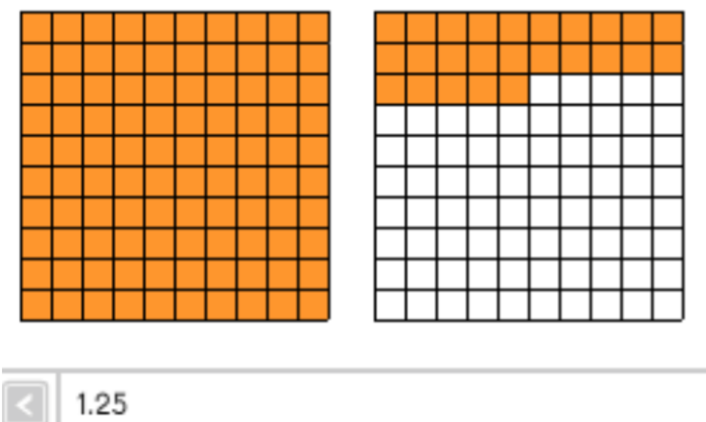
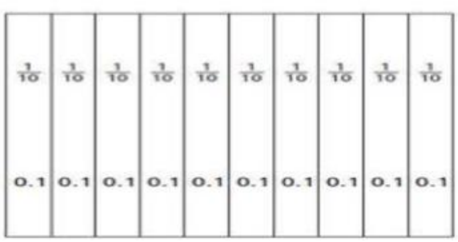
<table>
<tr>
<td>Place Value Chart</td>
<td>


<table>
<tr><th>Thousands</th><th>Hundreds</th><th>Tens</th><th>Ones</th><th>Tenths</th><th>Hundredths</th><th>Thousandths</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>


</td>
</tr>
<tr>
<td>Pictorial Place Value Chart</td>
<td>


</td>
</tr>
<tr>
<td>Base Ten Blocks</td>
<td>


</td>
</tr>
</table>

Thousandths Model	
Multiple Decimal Square Model	
Fractional Strips	

Assessment Framework

Unit 2 Assessment / Authentic Assessment Framework

Assessment	NJSLS	Estimated Time	Format
Pre Test 4	4.OA.3, 4.OA.4, 4.NF.1, 4.NF.6, 5.NF.1, 5.NF.2 5.NF.3, 5.NF.4.a	40 minutes	Individual
Mini Assessment #3	5.NF.3	10 minutes	Individual
Authentic Assessment #5	5.NF.1, 5.NF.2	25 minutes	Individual
Mini Assessment #4	5.NF.4.a, 5.NF.4.b	20 minutes	Individual
Authentic Assessment #6	5.NF.5.a, 5.NF.5.b	25 minutes	Individual
Mini Assessment #5	5.NF.5, 5.NF.6	15 minutes	Individual
Chapter Test/Review 4 +TP	5.NF.2, 5.NF.3, 5.NF.4, 5.NF.6, 5.NF.7.a, 5.NF.7.c	40 minutes	Individual
Authentic Assessment #7	5.NF.7	25 minutes	Individual
Mini Assessment #6	5.NF.7	40 minutes	Individual
Pre Test 5	2.OA.1, 3.OA.1, 3.OA.4, 3.OA.8, 4.OA.1	40 minutes	Individual
Chapter Test/Review 5 + TP (optional: test only numbers 2,3,6,7,9, and 10)	5.OA.2, 6.EE.2	15 minutes	Individual
Pre Test 8	3.NBT.3.b, 4.NBT.6, 5.NBT.3.a, 5.NBT.3.b, 5.NBT.4, 5.NBT.7	40 minutes	Individual
Chapter Test/Review 8 + TP	4.NF.6, 5.NBT.3, 5.NBT.3.a, 5.NBT.3.b, 5.NBT.4, 5.MD.1	40 minutes	Individual
Mini Assessment #7	5.NBT.1, 5.NBT.2, 5.NBT.3, 5.NBT.4	30 minutes	Individual
Authentic Assessment #8 (optional)	5.NF.5.a, 5.NF.5.b	25 minutes	Individual

	PLD	**Genesis Conversion**
Rubric Scoring	PLD 5	100
	PLD 4	89
	PLD 3	79
	PLD 2	69
	PLD 1	59

5th Grade Authentic Assessment #5 Dante's Saturday

Name:_______________________________________

Dante decided to spend Saturday at home and catching up on watching all of his favorite shows that he had missed throughout the week. Because he recorded all of the programs, sometimes he would 'skip" the commercials and fast forward to the best parts of each show.

- First, he watched two comedies. He spent $\frac{1}{3}$ of an hour watching the first comedy and ¾ of an hour watching the second comedy. About how much time did he spend in total watching the comedies?

- Dante recorded a total of $7\frac{5}{8}$ hours of television. $1\frac{1}{4}$ of that time was commercials. If Dante erases all of the commercials, how much time would be left of his recordings?

- Dante spent about $\frac{3}{5}$ of an hour watching his favorite cartoon. He liked it so much that he watched it a total of 3 times. How much time did he spend watching his favorite cartoon?

- Dante was watching a musical that lasted $2\ \frac{1}{2}$ hours and ended at 7pm. What time did he begin watching the musical?

Performance Task Scoring Rubric: Dante's Saturday

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. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

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.

Mathematical Practice: 1,6

SOLUTION:

- Dante spent **approximately 1 hour** watching the comedies.
- Dante's recordings are $\mathbf{6\frac{3}{8}}$ **hours** long.
- Dante watched his favorite cartoon for a total o f $\mathbf{\frac{9}{5}}$ **or** $\mathbf{1\frac{4}{5}}$ **hours.**
- Dante began watching the musical at **4:30pm.**

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Student gives all 4 correct answers. Clearly constructs and communicates a complete response based on explanations/reasoning using the: • properties of equivalent fractions • visual fraction models or equations • benchmark fractions • properties of operations Response includes an **efficient** and logical progression of steps.	**Student gives all 4 correct answers.** Clearly constructs and communicates a complete response based on explanations/reasoning using the: • properties of equivalent fractions • visual fraction models or equations • benchmark fractions • properties of operations Response includes a **logical** progression of steps	**Student gives all 3 correct answers.** Constructs and communicates a complete response based on explanations/reasoning using the: • properties of equivalent fractions • visual fraction models or equations • benchmark fractions • properties of operations Response includes a **logical but incomplete** progression of steps. Minor calculation errors.	**Student gives 2 correct answers.** Constructs and communicates an incomplete response based on explanations/reasoning using the: • properties of equivalent fractions • visual fraction models or equations • benchmark fractions • properties of operations Response includes an **incomplete or Illogical** progression of steps.	**Student gives less than 2 correct answers.** The student shows no work or justification.

5th Grade Authentic Assessment #6 – Reasoning About Multiplication

Name:____

Reasoning About Multiplication

Ellen explains: When you multiply by a number, you will always get a bigger answer. Look, I can show you.

Start with 9.
Multiply by 5. $9 \times 5 = 45$
The answer is 45, *and* $45 > 9$
45 *is bigger than* 9.

It even works for fractions.
Start with $\frac{1}{2}$.
Multiply by 4. $\frac{1}{2} \times 4 = 2$
The answer is 2, *and* $2 > \frac{1}{2}$
2 *is bigger than* $\frac{1}{2}$.

Ellen's calculations are correct, but her rule does not always work.

For what numbers will Ellen's rule work? For what numbers will Ellen's rule not work? Explain and give examples.

Authentic Assessment #6 Scoring Rubric: Reasoning About Multiplication

NJSLS.MATH.CONTENT.5.NF.B.5.A

Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

NJSLS.MATH.CONTENT.5.NF.B.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 $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

Mathematical Practices: 1 and 3

SOLUTION: Whenever you multiply a positive number by a factor greater than 1, the product will be larger than the original number. Both of Ellen's choices illustrate this principle.

Whenever you multiply a positive number by a positive factor less than 1, the product will be smaller than the original number. For example,

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

Both factors are less than 1, and the product is less than both factors.
Of course, whenever you multiply a number by 1, the product will be equal to the original number.

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Student correctly answers both questions and clearly constructs and communicates a complete response based on explanations/reasoning using : • Interpretation of multiplication as scaling Response includes an **efficient** and logical progression of steps.	Student correctly answers both questions and clearly constructs and communicates a complete response based on explanations/reasoning using: • Interpretation of multiplication as scaling Response includes a **logical** progression of steps	Student correctly answers one question and constructs and communicates a complete response based on explanations/reasoning using: • Interpretation of multiplication as scaling Response includes a **logical but incomplete** progression of steps. Minor calculation errors.	Student correctly answers one question and constructs and communicates an incomplete response based on explanations/reasoning using: • Interpretation of multiplication as scaling Response includes an **incomplete or Illogical** progression of steps.	The student shows no work or justification.

5th Grade Authentic Assessment #7 – Banana Pudding

Carolina is making her special banana pudding recipe (see below). She is looking for her cup measure, but can only find her quarter cup measure.

a) How many quarter cups does she need for the sour cream? Draw a picture (use other side if more space is needed) to illustrate your solution, and write an equation that represents the situation.

b) How many quarter cups does she need for the milk? Draw a picture (use other side if more space is needed) to illustrate your solution, and write an equation that represents the situation.

c) Carolina does not remember in what order she added the ingredients but the last ingredient added required 12 quarter cups. What was the last ingredient Carolina added to the pudding? Draw a picture (use other side if more space is needed) to illustrate your solution, and write an equation that represents the situation.

Carolina's Banana Pudding Recipe
2 cups sour cream 5 cups whipped cream 3 cups vanilla pudding mix 4 cups milk 8 bananas

Performance Task Scoring Rubric: Banana Pudding

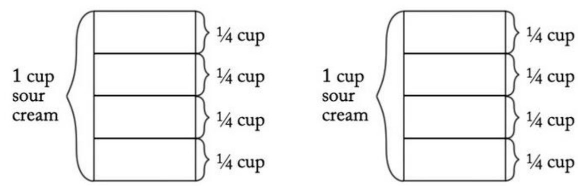
<u>NJSLS.MATH.CONTENT.5.NF.7</u>

Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

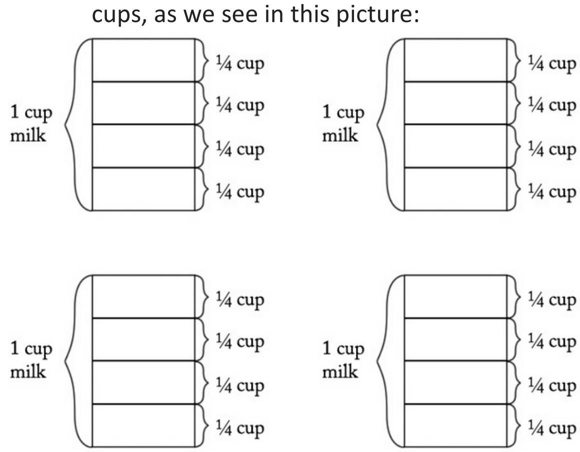
Mathematical Practices: 1, 2, and 5

SOLUTION:

a) Caroline needs 8 quarter cups of sour cream because there are 4 quarter cups in 1 cup, and so it takes 2 x 4 = 8 quarter cups to make 2 cups. This is a “how many groups” division problem because it asks, “How many quarter cups are in 2 cups? There are two correct equations. 2 ÷ ¼ = ? or . ? x ¼ = 2
We can verify that 8 is the correct solution by noting that 8 x ¼ = 8/4 = 2

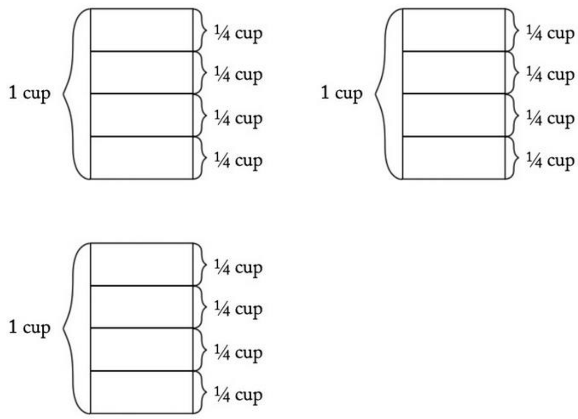


b) Carolina needs 16 quarter cups of milk because there are 4 quarter cups in 1 cup, and so 4 x 4 quarter cups in 4 cups, as we see in this picture:



This is a “how many groups” division problem because it asks, “How many quarter cups are in 4 cups? There are two correct equations. 4 ÷ ¼ = ? or . ? x ¼ = 4
We can verify that 16 is the correct solution by noting that 16 x ¼ = 16/4 = 4

c) We can think of this problem in several ways. First, we can ask, “How many cups did I start with if I ended up with 12 quarter cups?” We could write and equation for this: ? ÷ ¼ = 12
We could also say, “I have 12 quarter cups and I want to know how many cups this is, so I can multiply 12 and ¼ to find the number of cups I started with.” This can be represented by the following equation: 12 x ¼ =?
Notice that these two equations are equivalent and can both be interpreted in terms of the following picture:



Here is another approach: If we note that there are 4 quarter cups in 1 cup, we can also think of this as "how many groups?" division problem. We know that there are a total of 12 quarter cups and that there are 4 quarter cups in a cup (a group), and we want to know how many cups (or how many groups) this makes. Here the equations is: $12 \div 4 = ?$ Since $12 \div 4 = 3$, she must have started with the vanilla pudding mix, as that is the only ingredient that requires 3 cups.

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Student correctly answers all three parts clearly constructs and communicates a complete response based on explanations/reasoning using : • A visual fraction model • Properties of division • Division of unit fractions by whole numbers • Division of whole numbers by unit fractions Response includes an **efficient** and logical progression of steps.	Student correctly answers all three parts with a minor error in the explanation and clearly constructs and communicates a complete response based on explanations/reasoning using: • A visual fraction model • Properties of division • Division of unit fractions by whole numbers • Division of whole numbers by unit fractions Response includes a **logical** progression of steps	Student correctly answers two parts and constructs and communicates a complete response based on explanations/reasoning using: • A visual fraction model • Properties of division • Division of unit fractions by whole numbers • Division of whole numbers by unit fractions Response includes a **logical but incomplete** progression of steps. Minor calculation errors.	Student correctly answers one part and constructs and communicates an incomplete response based on explanations/reasoning using: • A visual fraction model • Properties of division • Division of unit fractions by whole numbers • Division of whole numbers by unit fractions Response includes an **incomplete or Illogical** progression of steps.	The student shows no work or justification.

5th Grade Authentic Assessment #8 – Calculator Trouble

Name:____

Luke had a calculator that will only display numbers less than or equal to 999,999,999. Which of the following products will his calculator display? Explain.

a. 792 x 999,999,999

b. $\frac{1}{2}$ x 999,999,999

c. $\frac{15}{4}$ x 999,999,999

d. 0.67 x 999,999,999

Performance Task Scoring Rubric: Calculator Trouble

5.NF. B.5.a Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

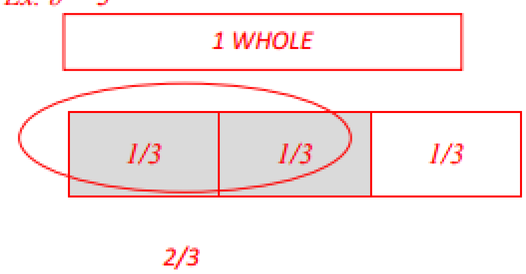
5.NF. B.5.b Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b=(n×a)/(n×b) to the effect of multiplying a/b by 1.

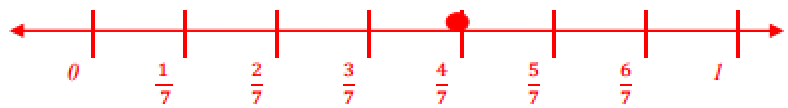
Mathematical Practice: 1, 2

SOLUTION: Since multiplying a positive number by a factor greater than 1 always results in a larger number, the first and third products will be too large to display. Since multiplying a positive number by a factor less than 1 (but greater than zero) always results in a smaller number, the second and fourth products will be displayed on his calculator.

Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
Student correctly identifies all parts as displaying or not displaying on the calculator Clearly constructs and communicates a complete response based on explanations/reasoning using: • Multiplication as Scaling (Resizing) Response includes an **efficient** and logical progression of steps.	**Student correctly identifies three parts as displaying or not displaying on the calculator with no conceptual errors** Clearly constructs and communicates a complete response based on explanations/ reasoning using: • Multiplication as Scaling (Resizing) Response includes a logical progression of steps	**Student correctly identifies two parts as displaying or not displaying on the calculator** Constructs and communicates a complete response based on explanations /reasoning using: • Multiplication as Scaling (Resizing) Response includes a logical but incomplete progression of steps. Minor calculation errors	**Student correctly identifies one part as displaying or not displaying on the calculator** Constructs and communicates an incomplete response based on explanations /reasoning using the: • Multiplication as Scaling (Resizing) Response includes an incomplete or Illogical progression of steps.	The student shows no work or justification

NJDOE 3rd -5th Grade Mathematics Revisions

Grade level	***Standard***	***Revised Standard***
3	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. For example, describe a context in which a total number of objects can be expressed as 5 × 7.	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. For example, describe and/or represent a context in which a total number of objects can be expressed as 5 × 7.
3	3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.	3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe and/or represent a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.
3	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	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. *Ex. b = 3* 
3	3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a.	3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/b on a

	Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.	number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line. *Ex. a = 4; b = 7* 
3	3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).
4	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 Know relative sizes of measurement units within one system of units including km, m, cm, mm; 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), ...
5	5.MD.5b. Apply the formulas V = l × w × h and V = b × h for rectangular prisms to find volumes of right rectangular prisms with whole- number edge lengths in the context of solving real world and mathematical problems	5.MD.5b Apply the formulas V = l × w × h and V = B × h for rectangular prisms to find volumes of right rectangular prisms with whole- number edge lengths in the context of solving real world and mathematical problems
5	5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.