Math Grade 4

Grade/Subject	Grade Four/Mathematics
Unit Title	Unit 1: Whole Numbers, Place Value, and Computation
Overview of Unit	In this unit, students will be extending their understanding of place value of whole numbers. Students will learn how to correctly read and write numbers through the millions place in standard, expanded, and written form. Students will also be able to identify the place value names for multi-digit whole numbers up to the millions place while recognizing that each place is ten times bigger than the place to its right. With a solid understanding of place value, students will apply this knowledge to accurately round whole numbers to any place, compare numbers, as well as accurately add and subtract multi-digit numbers.
Pacing	3-4 Weeks

Essential Questions (and Corresponding Big Ideas)

- **How many ways can I represent a number?** Numbers can be represented in multiple ways, such as in word form, standard form, and expanded form.
- **Why is it important to understand place value?** I can use place value understanding to perform multi-digit arithmetic, compare numbers, as well as round numbers to estimate.
- **How does a digit's position affect its value?** A digit in one place represents ten times what it represents in the place to its right.
- **What strategies help me add and subtract multi-digit numbers?** I can use the properties of place value and operations to fluently add and subtract multi-digit numbers.

Core Content and Practice Standards	Explanations and Examples*
4.NBT.1: Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. ***For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.***	Students should be familiar with and use place value as they work with numbers. Some activities that will help students develop understanding of this standard are: • Investigate the product of 10 and any number, then justify why the number now has a 0 at the end. (7 x 10 = 70 because 70 represents 7 tens and no ones, 10 x 35 = 350 because the 3 in 350 represents 3 hundreds, which is 10 times as much as 3 tens, and the 5

	represents 5 tens, which is 10 times as much as 5 ones.) While students can easily see the pattern of adding a 0 at the end of a number when multiplying by 10, they need to be able to justify why this works. • Investigate the pattern, 6, 60, 600, 6,000, 60,000, and 600,000 by dividing each number by the previous number.
4.NBT.2: Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	The expanded form of 275 is 200 + 70 + 5. Students use place value to compare numbers. For example, in comparing 34,570 and 34,192, a student might say, both numbers have the same value of 10,000s and the same value of 1,000s however, the value in the 100s place is different so that is where I would compare the two numbers.
4.NBT.3: Use place value understanding to round multi-digit whole numbers to any place.	When students are asked to round large numbers, they first need to identify which digit is in the appropriate place. **Example**: Round 76,398 to the nearest 1000. • Step 1: Since I need to round to the nearest 1000, then the answer is either 76,000 or 77,000. • Step 2: I know that the halfway point between these two numbers is 76,500. • Step 3: I see that 76,398 is between 76,000 and 76,500. • Step 4: Therefore, the rounded number would be 76,000.

4.NBT.4: Fluently add and subtract multi-digit whole numbers using the standard algorithm.	Students build on their understanding of addition and subtraction, their use of place value and their flexibility with multiple strategies to make sense of the standard algorithm. They continue to use place value in describing and justifying the processes they use to add and subtract. When students begin using the standard algorithm their explanation may be quite lengthy. After much practice with using place value to justify their steps, they will develop fluency with the algorithm. Students should be able to explain why the algorithm works. • 3892 + 1567 Student explanation for this problem: 1. Two ones plus seven ones is nine ones. 2. Nine tens plus six tens is 15 tens. 3. I am going to write down five tens and think of the10 tens as one more hundred. (Notates with a 1 above the hundreds column.) 4. Eight hundreds plus five hundreds plus the extra hundred from adding the tens is 14 hundreds. 5. I am going to write the four hundreds and think of the 10 hundreds as one more 1000. (Notates with a 1 above the thousands column.) 6. Three thousands plus one thousand plus the extra thousand from the hundreds is five thousand.

Standards for Mathematical Practices (SMP)

1. **Make sense of problems and persevere in solving them.**
2. Reason abstractly and quantitatively.
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. Use appropriate tools strategically.
6. **Attend to precision.**
7. **Look for and make use of structure.**
8. Look for and express regularity in repeated reasoning.

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  <u>- 928</u>

  Student explanation for this problem:

  1. There are not enough ones to take 8 ones from 6 ones so I have to use one ten as 10 ones. Now I have 3 tens and 16 ones. (Marks through the 4 and notates with a 3 above the 4 and writes a 1 above the ones column to be represented as 16 ones.)
  2. Sixteen ones minus 8 ones is 8 ones. (Writes an 8 in the ones column of answer.)
  3. Three tens minus 2 tens is one ten. (Writes a 1 in the tens column of answer.)
  4. There are not enough hundreds to take 9 hundreds from 5 hundreds so I have to use one thousand as 10 hundreds. (Marks through the 3 and notates with a 2 above it. (Writes down a 1 above the hundreds column.)
  5. Now I have 2 thousand and 15 hundreds.
  6. Fifteen hundreds minus 9 hundreds is 6 hundreds.
  7. (Writes a 6 in the hundreds column of the answer).
  8. I have 2 thousands left since I did not have to take away any thousands. (Writes 2 in the thousands place of answer.)

Note: Students should know that it is mathematically possible to subtract a larger number from a smaller number but that their work with whole numbers does not allow this as the difference would result in a negative number.

K-U-D	
KNOW *Facts, formulas, information, vocabulary*	Vocabulary: Digit, number, base ten, place value (ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions) value, greater than, less than, equal to, equations, expanded notation, standard notation, word form, rounding, compare, add, subtract, etc.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	The value of a number is determined by its place. A number in one place represents ten times what it represents in the place to its right and one-tenth the value of the digit to its left. Place value is used to compare numbers. Understanding place value is essential to accurately add and subtract multi-digit numbers. Numbers can be represented in multiple ways. A number can be written using standard notation, its written name, or expanded notation. Rounding is an estimation strategy for problem solving and estimating. Depending on the context, rounding can be used when precision and accuracy are not essential.
DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Recognize (a digit in a whole number is ten times the value of a digit to its right.) Recognize (patterns of ten.) Model and represent (numbers using base ten blocks.) Read (multi-digit whole numbers.) Write (multi-digit numbers in various forms such as written form, standard form, and expanded form.) Compare (multi-digit numbers using <,>, or =) Write (numbers on a place value chart.) Round (multi-digit whole numbers.) Read and interpret (word problems.) Use (place value and properties of operations to fluently) add and subtract (multi-digit numbers up to one million.) Solve (word problems.)

Academic Vocabulary

- **Base Ten –** The base ten system is another name for the decimal number system that we use every day.
- **Digit**- The ten symbols, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.
- **Equal to –** Exactly the same amount or value.
- **Equations** -- A mathematical statement that says that two expressions have the same value; any number sentence with an =.
- **Expanded Notation** – Writing a number to show the value of each digit.
- **Greater than—** Bigger: The symbol > means greater than.
- **Less than –** Smaller: The symbol < means less than.
- **Maximum** -- The largest value.
- **Minimum**—The smallest value
- **Number** -- A count or measurement.
- **Standard Notation –** The number as we normally write it with digits.
- **Value --** The result of a calculation.
- **Word Form** – Writing a number in words.

Interdisciplinary Connections

- Reading – Use literature connections above for read-aloud during reading and math lessons. Discuss with students how every story has a problem and solution, as does a math problem. Some problems in the literature are solved by a student using their knowledge of math concepts.

- Writing – Hold students accountable for writing explanations in their math notebooks or one math worksheets explaining their thinking. They need to apply rules of grammar and spelling. For example, they should always have a capital at the beginning of the sentence, a period at the end, and commas where appropriate.

Tools/Manipulatives

The following tools and manipulatives can be used throughout the unit, but are not required or essential:

- Base-ten blocks
- Graph paper (to help students line up their numbers being added/subtracted)
- Calculator
- Number lines
- Dice
- Playing cards
- Place-value chart
- Math notebook

- Chart paper
- Technology resources available (Smartboard, iPad, computers)

Suggested Formative Assessment Practices/Processes
• Exit slips • Any of the key learning activities can be used to assess student understanding. This includes the responses the students recorded in their math notebooks. • Teacher observation

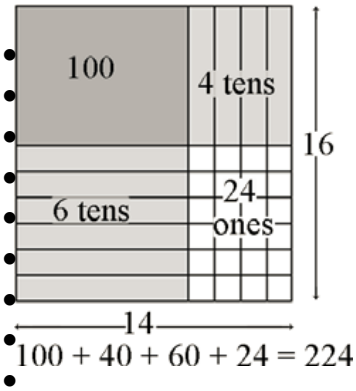
Math Grade 4

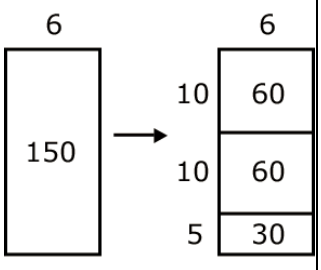
	Mathematics Grade 4
Unit Title	Unit 2: Multiplication and Division of Whole Numbers
Overview of Unit	In this unit, students will continue to expand their knowledge and understandings of multiplication and division from grade 3. This unit will extend multiplication and division to include multi-digit numbers and more complex problem types. They will use various models and strategies, such as area models, base ten blocks, or arrays to multiply and divide. Students will solve multi-step problems involving multiplication and division. This unit will also explore prime and composite numbers and the relationship between factors and multiples. Students will apply this knowledge to solve multiplication and division problems.
Pacing	7-8 weeks

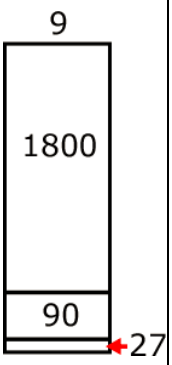
Essential Questions (and Corresponding Big Ideas)

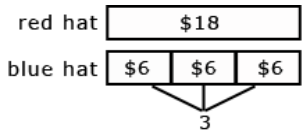
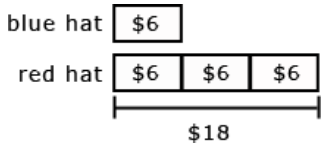
- **How are multiplication and division related?** Multiplication and division are inverse operations. In multiplication, we find the product of two factors. However, in division we find the missing factor if the other factor and the product are known.
- **Why is it important to know strategies for multiplication and division?** Strategies can help solve a problem. Multiplication and division problems can be solved using multiple strategies and tools. I can use arrays, place value, area models, as well as the properties of operations to help me solve multiplication and division problems.
- **What is a sensible answer to a real problem?** When solving problems, it is important to determine the best operation to use. When using multiplication and division to solve problems, it is also important to assess the appropriateness of the response. For example, it is important to think about what affect a remainder may have on the answer. Checking for reasonableness will help check accuracy of my answers and make sense of my solutions.
- **How are factors, multiples, and products different?** Factors are the numbers multiplied to find a product. However, each factor in the context of a real problem can have a different meaning. Every whole number is a multiple of its factors.

Core Content and Practice Standards	Explanations and Examples*
4.NBT.5: Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties	**4.NBT.5**. Students who develop flexibility in breaking numbers apart have a better understanding of the importance of place value and the distributive property in multi-digit multiplication. Students use base ten blocks, area models, partitioning, compensation strategies, etc. when multiplying whole numbers and use words and diagrams to explain their thinking. They use the terms factor and product when communicating their reasoning. Multiple strategies enable students to develop fluency with multiplication and transfer that understanding to

of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	division. Use of the standard algorithm for multiplication is an expectation in the 5th grade. Students may use digital tools to express their ideas. Use of place value and the distributive property are applied in the examples below. • To illustrate 154 x 6 students use base 10 blocks or use drawings to show 154 six times. Seeing 154 six times will lead them to understand the distributive property, 154 X 6 = (100 + 50 + 4) x 6 = (100 x 6) + (50 X 6) + (4 X 6) = 600 + 300 + 24 = 924. • The area model shows the partial products. 14 × 16 = 224 Using the area model, students first verbalize their understanding: • 10 × 10 is 100 • 4 × 10 is 40 • 10 × 6 is 60, and • 4 × 6 is 24. They used different strategies to record this type of thinking.  100 + 40 + 60 + 24 = 224 • Students explain this strategy and the one below with base 10 blocks, drawings, or numbers. 25 × 24 400 (20 × 20) 100 (20 × 5) 80 (4 × 20) 20 (4 × 5) 600 • 25 × 24 500 (20 × 25)

	100 (4 × 25) 600
4.NBT.6: Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	4.NBT.6 In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context. Examples: A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box? • Using Base 10 Blocks: Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50. • Using Place Value**:** 260 ÷ 4 = (200 ÷ 4) + (60 ÷ 4) • Using Multiplication**:** 4 x 50 = 200, 4 x 10 = 40, 4 x 5 = 20; 50 + 10 + 5 = 65; so 260 ÷ 4 = 65 • Using an Open Array or Area Model After developing an understanding of using arrays to divide, students begin to use a more abstract model for division. This model connects to a recording process that will be formalized in the 5th grade. Example 1: 150 ÷ 6 Students make a rectangle and write 6 on one of its sides. They express their understanding that they need to think of the rectangle as representing total of 150.  1. Students think, 6 times what number is close to 150? They recognize that 6 × 10 is 60, so they record 10 as a factor and partition the rectangle into 2 rectangles and label the area aligned to the factor of 10 with 60. They express that they have only used 60 of the 150, so they have 90 left. 2. Recognizing that there is another 60 in what is left, they repeat the

	process above. They express that they have used 120 of the 150, so they have 30 left. 3. Knowing that 6 × 5 is 30, they write 30 in the bottom area of the rectangle and record 5 as a factor. 4. Students express their calculation in various ways: a. 150 — 90 — - 60 (6 × 10) — 30 — - 30 (6 × 5) — 0 150 ÷ 6 = 10 + 10 + 5 = 25 b. 150 ÷ 6 = (60 ÷ 6) + (60 ÷ 6) + (30 ÷ 6) = 10 + 10 + 5 = 25 Example 2: 1917 ÷ 9 A student's description of his or her thinking may be: I need to find out how many 9s are in 1917. I know that 200 × 9 is 1800. So if I use 1800 of the 1917, I have 117 left. I know that 9 × 10 is 90. So if I have 10 more 9s, I will have 27 left. I can make 3 more 9s. I have 200 nines, 10 nines and 3 nines. So I made 213 nines. 1917 ÷ 9 = 213. 
4.OA.A.1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.	4.OA.A.1 A *multiplicative comparison* is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., "*a* is *n* times as much as *b*"). Students should be able to identify and verbalize which quantity is being multiplied and which number tells how many times.
4. OA.A.2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by	4. OA.A.2**.** Students need many opportunities to solve contextual problems. Table 2 includes the following multiplication problem: • A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?

using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.	In solving this problem, the student should identify $6 as the quantity that is being multiplied by 3. The student should write the problem using a symbol to represent the unknown. ($6 x 3 = ☐)  Table 2 includes the following division problem: • A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? In solving this problem, the student should identify $18 as the quantity being divided into shares of $6. The student should write the problem using a symbol to represent the unknown. ($18 ÷ $6 = ☐)  When distinguishing multiplicative comparison from additive comparison, students should note that additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, “How many more?” Multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How many miles did Karen run?). A simple way to remember this is “How many times as much?” or “How many times as many?”

4.OA.A.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**OA.A.3.** Students need many opportunities solving multistep story problems using all four operations. **Example**: Chris bought clothes for school. She bought 3 shirts for $12 each and a skirt for $15. How much money did Chris spend on her new school clothes? 3 x $12 + $15 = *a* In division problems, the remainder is the whole number left over when as large a multiple of the divisor as possible has been subtracted. **Examples**: • Kim is making candy bags. There will be 5 pieces of candy in each bag. She had 53 pieces of candy. She ate 14 pieces of candy. How many candy bags can Kim make now? (7 bags with 4 leftover) • Kim has 28 cookies. She wants to share them equally between herself and 3 friends. How many cookies will each person get? (7 cookies each) 28 ÷ 4 = *a* • There are 29 students in one class and 28 students in another class going on a field trip. Each car can hold 5 students. How many cars are needed to get all the students to the field trip? (12 cars, one possible explanation is 11 cars holding 5 students and the 12^{th} holding the remaining 2 students) 29 + 28 = 11 x 5 + 2 Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies include, but are not limited to: • front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts); • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate); • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values);

	using friendly or compatible numbers such as factors (students seek to fit numbers together - e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000); and using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).
4. OA.B.4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	**4. OA.B.4** Students should understand the process of finding factor pairs so they can do this for any number 1 -100. **Example**: • Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12. Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20). **Example**: • Factors of 24: 1, 2, 3, 4, 6, 8,12, 24 Multiples : 1,2,3,4,5…24 2,4,6,8,10,12,14,16,18,20,22,24 3,6,9,12,15,18,21,24 4,8,12,16,20,24 8,16,24 12,24 24 To determine if a number between 1-100 is a multiple of a given one-digit number, some helpful hints include the following: ○ all even numbers are multiples of 2 ○ all even numbers that can be halved twice (with a whole number result) are multiples of 4 ○ all numbers ending in 0 or 5 are multiples of 5 Prime vs. Composite: • A prime number is a number greater than 1 that has only 2 factors, 1 and itself. • Composite numbers have more than 2 factors. Students investigate whether numbers are prime or composite by:

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building rectangles (arrays) with the given area and finding which numbers have more than two rectangles (e.g. 7 can be made into only 2 rectangles, 1 x 7 and 7 x 1, therefore it is a prime number)
finding factors of the number.

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<td>4.OA.C.5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</td>
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4.OA.C.5. Patterns involving numbers or symbols either repeat or grow. Students need multiple opportunities creating and extending number and shape patterns. Numerical patterns allow students to reinforce facts and develop fluency with operations.

Patterns and rules are related. A pattern is a sequence that repeats the same process over and over. A rule dictates what that process will look like. Students investigate different patterns to find rules, identify features in the patterns, and justify the reason for those features.

Example:
<table>
<tr><th>Pattern</th><th>Rule</th><th>Feature(s)</th></tr>
<tr><td>3, 8, 13, 18, 23, 28, …</td><td>Start with 3, add 5</td><td>The numbers alternately end with a 3 or 8</td></tr>
<tr><td>5, 10, 15, 20 …</td><td>Start with 5, add 5</td><td>The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number.

The numbers that end in 0 are products of 5 and an even number.</td></tr>
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After students have identified rules and features from patterns, they need to generate a numerical or shape pattern from a given rule.
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	Example: • Rule: Starting at 1, create a pattern that starts at 1 and multiplies each number by 3. Stop when you have 6 numbers. Students write 1, 3, 9, 27, 81, 243. Students notice that all the numbers are odd and that the sums of the digits of the 2 digit numbers are each 9. Some students might investigate this beyond 6 numbers. Another feature to investigate is the patterns in the differences of the numbers (3 - 1 = 2, 9 - 3 = 6, 27 - 9 = 18, etc.)

Standards for Mathematical Practices (SMP)

9. Make sense of problems and persevere in solving them.
10. Reason abstractly and quantitatively.
11. Construct viable arguments and critique the reasoning of others.
12. Model with mathematics.
13. Use appropriate tools strategically.
14. Attend to precision.
15. Look for and make use of structure.
16. Look for and express regularity in repeated reasoning.

K-U-D	
KNOW *Facts, formulas, information, vocabulary*	**Vocabulary:** *operation, multiplication, multiply, division, divide, commutative property, distributive property, factors, multiples, product, multiplier, multiplicand, divisor, dividend, quotient, estimate, prime, composite, value, remainder, rectangular array, area model, expanded notation, base ten, partial product area model, even, odd, decompose, digit, equation, factor rainbow, factor tree, number, pattern, standard notation, whole number* Math facts (multiplication and division within 100) Strategies for multiplying and dividing multi-digit numbers (partial products, area model, distributive property, etc.) Strategies for finding all the factors of a number. Difference between prime and composite numbers.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas*	Multiplication and division are inverse operations. Problems can be solved using multiple strategies. Factors and multiples are related in ways that are similar to the way that multiplication and division are related. Numbers can be decomposed to help multiply and divide.

that transfer across situations	
DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Interpret (the meaning of a multiplication equation.) Interpret (a multiplication equation as a comparison.) Write (algebraic expressions and equations to match word problems) Represent (verbal multiplicative comparisons with equations) Distinguish (multiplication comparison from additive comparison) Make (drawings to represent word problems.) Create (arrays and area models.) Use (arrays, area models, distributive property, and partial product strategies) *note the standard algorithm is not expected at this time Multiply (multi-digit whole numbers; 4-digit by 1 or 2-digit only) Divide (multi-digit whole numbers; 4-digit by 1-digit only) Illustrate/Explain (calculations) Use (a symbol and/or letters for unknowns) Read and interpret (multi-step word problems involving multiplication and division.) Solve (multi-step word problems involving multiplication and division.) Interpret (the remainder of a division problem appropriately.) Determine (the reasonableness of an answer.) Identify (numbers as odd or even, prime or composite.) Find (factors and multiples of given numbers 0-100) Generate and Justify (a pattern from a rule) Identify (implicit features of a pattern) Recognize (a whole number is a multiple of its factors.) Describe (the difference between a factor and a multiple.)

Academic Vocabulary

- **Area Model**— Visual representation of a multiplication equation.
- **Base Ten –** The Base Ten System is another name for the decimal number system that we use every day.
- ***Commutative property –*** a*b = b*a.
- ***Composite* -** A natural number that is not prime.
- ***Decomposition –*** The process of separating numbers into their components.
- ***Digit* -** The ten symbols, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The number 215 has three digits: 2, 1, and 5
- **Distributive Property** -- a(b + c) = ab + ac
- **Divide-**to separate into equal groups
- **Dividend** -- In a / b = c, a is the dividend.
- **Division-**the operation of making equal groups and finding the number in each group or finding the number of groups
- **Divisor** -- In a / b = c, b is the divisor.

- ***Equation -*** A mathematical statement that says that two expressions have the same value; any number sentence with an =.
- ***Estimate***-an answer that is close to the exact answer, to guess about
- ***Even number***- A natural number that is divisible by 2.
- **Expanded Notation** – Writing a number to show the value of each digit.
- ***Factor -*** One of two or more expressions that are multiplied together to get a product.
- ***Factor rainbow –*** A different way to visually represent a factor tree.
- ***Factor tree –*** A structure used to find the prime factorization of a positive integer.
- ***Multiple -*** the product of that number and any other whole number. Zero is a multiple of every number.
- ***Multiplication***-the operation using repeated addition of the same number
- ***Multiply-*** to join equal groups
- ***Number –***a count or measurement.
- ***Odd number*** – A whole number that is not divisible by 2
- ***Operation***-an arithmetic procedure used to solve a mathematical problem, such as addition, subtraction, multiplication, or division
- **Partial Product Area Model**— Visual representation of a multiplication equation that has multi-digit factors.
- ***Pattern -*** Things that are arranged following a rule or rules
- ***Prime number -*** A number whose only factors are itself and 1.
- ***Product*** –The result of two numbers being multiplied together.
- **Quotient** -- The answer to a division problem.
- **Rectangular Array** – Visual representation of an equation.
- ***Remainder –*** The part left over after long division.
- **Standard Notation** – The number as we normally write it with digits.
- **Value --** The result of a calculation.
- ***Whole number -*** The set of numbers that includes zero and all of the natural numbers.

Interdisciplinary Connections

Language Arts:

- Students can read many of the books mentioned above related to the topics of multiplication and division.
- Teacher can read aloud many of the books as well to the students.

- Students can write multiplication and division story problems to be solved by their classmates.
- Students can write in their math journals about the strategies and processes they are using to solve problems.

Art:

- Students can make arrays of objects to model multiplication and division facts.
- Students can take photographs of objects in the real world that show arrays. (example: a muffin tin, a box of chocolates, etc.)

- Students can try to replicate an image to twice or three times its original size.

Music:

- Students can sing multiplication songs to help learn their basic facts.

- Social Studies:Examine scale on maps. Students can write equations to match the scale and solve for distance.

Tools/Manipulatives

The following tools and manipulatives can be used throughout the unit, but are not required or essential:

- Calculator
- Number lines
- Hundreds chart
- Base Ten Blocks
- Graph paper
- Math notebook
- Colored writing utensils
- Counters or chips
- Technology resources available (SMARTboard, iPad, computers)
- Chart paper
- Ruler
- Manipulatives
  Colored tiles/chips

Suggested Formative Assessment Practices/Processes

Exit slips

- Any of the key learning activities can be used to assess student understanding. This includes the responses the students recorded in their math notebooks.

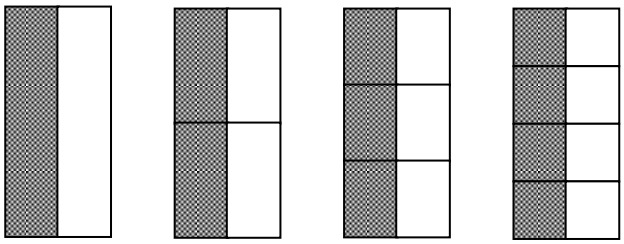
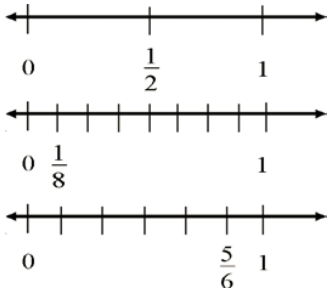
- Teacher observation

Grade/Subject	Grade 4 Mathematics
Unit Title	Unit 3: Equivalent Fractions and Comparing Fractions
Overview of Unit	In this unit, students will build upon their prior knowledge and understanding of fraction equivalence and ordering. They will use various strategies, such as visual fraction models, to explain how two fractions can be equivalent. They will recognize as well as generate equivalent fractions. This unit will also give students experiences with comparing fractions with different numerators and denominators. This can be accomplished with various strategies such as models, half as a benchmark, or making equivalent fractions with common denominators. In this unit, the grade 4 expectation is to have students work with fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.
Pacing	4 Weeks

Essential Questions (and Corresponding Big Ideas)

- **How do you represent numbers in different ways?** There are multiple ways to write a fraction of the same size. Although the number and size of the parts may differ, equivalent fractions themselves are the same size.
- **Why is it important to compare values in the real world?** It is important to compare values so you understand which value is greater. There are many strategies for comparing the values of fractions.
- **How can you use benchmarks to determine the size/value of a numeral?** You can use benchmarks to help you compare the size/value of a numeral. Half as a benchmark is very helpful to compare the size of fractions. Benchmarks can also help you decompose a fraction into fractional parts.

Core Content and Practice Standards	Explanations and Examples*
4.NF.1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions	**4.NF.1.** This standard extends the work in third grade by using additional denominators (5, 10, 12, and 100). [Grade 3 expectations are limited to fractions with denominators of 2, 3, 4, 6, and 8.] Students can use visual models or applets to generate equivalent fractions. All the models show 1/2. The second model shows 2/4 but also shows that 1/2 and 2/4 are equivalent fractions because their areas are equivalent. When a

	horizontal line is drawn through the center of the model, the number of equal parts doubles and size of the parts is halved. Students will begin to notice connections between the models and fractions in the way both the parts and wholes are counted and begin to generate a rule for writing equivalent fractions. 1/2 x 2/2 = 2/4.  $\frac{1}{2}$ $\frac{2}{4}=\frac{2\times1}{2\times2}$ $\frac{3}{6}=\frac{3\times1}{3\times2}$ $\frac{4}{8}=\frac{4\times1}{4\times2}$ Technology Connection: http://illuminations.nctm.org/activitydetail.aspx?id=80 **4.NF.2.** Benchmark fractions include common fractions between 0 and 1 such as halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths, and hundredths. Fractions can be compared using benchmarks, common denominators, or common numerators. Symbols used to describe comparisons include <, >, =. Fractions may be compared using ½ as a benchmark. 
4.NF.2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.	

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

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

b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.
Examples: $3/8=1/8+1/8+1/8$; $3/8=1/8+2/8$; $2\ 1/8=1+1+1/8=8/8+8/8+1/8$.

Standards for Mathematical Practice (SMP)
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Possible student thinking by using benchmarks: $\frac{1}{8}$ is smaller than $\frac{1}{2}$ because when 1 whole is cut into pieces, the pieces are much smaller than when 1 whole is cut into 2 pieces.

Possible student thinking by creating common denominators: $\frac{5}{6} > \frac{1}{2}$ because $\frac{3}{6} = \frac{1}{2}$ and $\frac{5}{6} > \frac{3}{6}$

Fractions with common denominators may be compared using the numerators as a guide: $\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$

Fractions with common numerators may be compared and ordered using the denominators as a guide:
$\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$

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

Examples:

- Fraction Example 1:
  2/3 = 1/3 + 1/3

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

ISTE Standards	
(http://www.iste.org/standards/nets-for-students.aspx)	
K-U-D	
KNOW *Facts, formulas, information, vocabulary*	*Vocabulary: whole, part, fraction, numerator, denominator, whole number, factor, multiples, common multiple, least common denominator, fractions greater than one, mixed numbers, equivalent fractions, visual model, half as benchmark, unit fraction, simplify, number line,* Fractions have a numerator and denominator. The denominator represents the number of pieces that make up a whole. The numerator refers to the number of pieces of the whole that make up the fraction Fractions can be put into simplest terms. Fractions greater than one refers to "improper fractions." Signs can be used to compare fractions.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	A number can be represented as a fraction. Fractions can be represented in multiple ways. Visual fraction models and equations can represent the solution to a problem. Fractions can be both equivalent and nonequivalent. Recognize that comparisons are only valid when referring to the same whole
DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Identify (the numerator and denominator in a fraction.) Use (visual models to compare fractions.) Compare (fractions with different numerators and denominators.) Compare (fractions using <,>, or = using half as a benchmark.) Generate (equivalent fractions.) Recognize and identify (equivalent fractions with unlike denominators.) Explain (why equivalent fractions are equivalent using visual models.) Justify (conclusions with visual fraction models.) Add and subtract (fractional parts referring to the same whole.) Decompose (fractions into the sum of unit fractions.)
Academic Vocabulary	
• **Common multiple:** A multiple of two or more numbers • **Compare:** • **Decompose:** • **Denominator:** The bottom portion in a fraction that describes the number of pieces of the	

whole

- **Equivalent fractions:** Fractions that reduce to the same number
- **Factor:** One of two or more expressions that are multiplied together to get a product
- **Fraction:** A number expressible in the form a/b where a is a whole number and b is a positive whole number
- **Fraction Greater than One:**
- **Half as a benchmark:**
- **Least common denominator:** The smallest multiple of the denominators of two or more
- **Mixed numbers:** A number written as a whole number and a fraction
- **Multiples:** The product of a number and any other whole number.
- **Number line:**
- **Numerator:** The top portion in a fraction that describes the number of parts of a whole
- **Part:** A portion of an object
- **Simplify**
- **Unit fraction**
- **Visual model:**
- **Whole:** An entire object
- **Whole number:** The numbers 0, 1, 2, 3…

Interdisciplinary Connections

Reading:

Read aloud books that cover topics relating to fractions, equivalent fractions, and comparing fractions.

Cooking:

- Students can read and make recipes using fractional parts requiring them to use equivalent fractions (i.e. you need ½ cup of flour, but you only have ¼ measuring cup)

Writing:

- Write convincing arguments to support equivalent fractions.

Art:

- Make fraction bars to help identify equivalent fractions.
- Create quilts using fractional pieces

Tools/Manipulatives

- Blank paper
- Fraction strips/cubes
- Writing utensils
- Fraction games (located in identified learning activity attachments)

- Grid paper
- Number lines
- Metric rulers
- Math notebooks
- Calculators
- Beads

Grade/Subject	Grade 4 Mathematics
Unit Title	Unit 4: Fractions and Decimals
Overview of Unit	In this unit, students will specifically look at decimal fractions (fractions with denominators of10 and 100) and decimals. They will work with decimal fractions to create equivalent fractions to better add and compare decimal fractions. Students will also explore the idea that decimal fractions can be represented as a decimal as well. Students will understand the place value of decimals and its relation to fractions. They will also learn to read and write decimal, add decimals, locate decimals on a number line, and compare decimals.
Pacing	3-4 Weeks

Essential Questions (and Corresponding Big Ideas)

Essential Questions

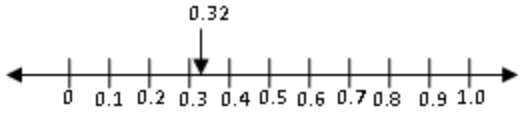
- **How do you represent numbers in different ways?** Fractions can be represented in various ways, including decimal notation. Decimal fractions with denominators of 10 and 100 can be made into decimals.
- **How are fractions and decimals related?** Fractions and decimals both represent parts of a whole.
- **How can I represent part-whole values (fraction or decimal) in multiple ways?** Fractions and decimals can be represented in multiple forms, including numerical, pictorial, the base-ten system, and using number lines.
- **Why is it important to understand place value?** I can use place value to help me understand the value of a decimal number.

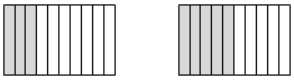
Core Content and Practice Standards	Explanations and Examples*
4.NF.C.5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.* (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general, but	Students can use base ten blocks, graph paper, and other place value models to explore the relationship between fractions with denominators of 10 and denominators of 100. Students may represent 3/10 with 3 longs and may also write the fraction as 30/100 with the whole in this case being the flat (the flat represents one hundred units with each unit equal to one hundredth). Students begin to make connections to the place value chart as shown in 4.NF.6.

<table>
<tr><td>addition and subtraction with unlike denominators in general is not a requirement at this grade.)</td><td>This work in fourth grade lays the foundation for performing operations with decimal numbers in fifth grade.</td></tr>
<tr><td>4.NF.C.6. Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $^{62}/_{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</td><td>Students make connections between fractions with
<table><tr><td>Hundreds</td><td>Tens</td><td>Ones</td><td>•</td><td>Tenths</td><td>Hundredths</td></tr><tr><td></td><td></td><td></td><td>•</td><td>3</td><td>2</td></tr></table>denominators of 10 and 100 and the place value chart. By reading fraction names, students say 32/100 as thirty-two hundredths and rewrite this as 0.32 or represent it on a place value model as shown below.

Students use the representations explored in 4.NF.5 to understand 32/100 can be expanded to 3/10 and 2/100.

Students represent values such as 0.32 or 32/100 on a number line. 32/100 is more than 30/100 (or 3/10) and less than 40/100 (or 4/10). It is closer to 30/100 so it would be placed on the number line near that value.

 
</td></tr>
<tr><td>4.NF.C.7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the</td><td>Students build area and other models to compare decimals. Through these experiences and their work with fraction models, they build the understanding that comparisons between decimals or fractions are only valid when the</td></tr>
</table>

results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.	whole is the same for both cases. • Each of the models below shows 3/10 but the whole on the right is much bigger than the whole on the left. They are both 3/10 but the model on the right is a much larger quantity than the model on the left.  When the wholes are the same, the decimals or fractions can be compared. **Example**: • Draw a model to show that 0.3 < 0.5. (Students would sketch two models of approximately the same size to show the area that represents three-tenths is smaller than the area that represents five-tenths. 
Standards for Mathematical Practice (SMP) **1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. **5. Use appropriate tools strategically.** 6. Attend to precision. **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**	

ISTE Standards
(http://www.iste.org/standards/nets-for-students.aspx) • NETS.S.1.c: *Students demonstrate create thinking, construct knowledge and develop innovative products and processes using technology: Use models and simulations to explore complex systems and issues* • NETS.S.3.a: *Students apply digital tools to gather, evaluate, and use information: Plan strategies to guide inquiry* • NETS.S.3.b: *Students apply digit tools to gather, evaluate, and use information: Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media*. • NETS.S.4.a: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources: Identify and define authentic problems and significant questions for investigation* • NETS.S.4.d: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems and make informed decisions using appropriate digital tools and resources: Use multiple processes and diverse perspectives to explore alternative solutions*

K-U-D	
KNOW *Facts, formulas, information, vocabulary*	*Vocabulary: part, whole, fraction, denominator, numerator, equivalent fraction, fraction notation, compare, greater than, less than, decimal fraction, decimal, decimal notation, decimal point, tenths, hundredths, number line, sum* A number can be represented as either a fraction or a decimal. A fraction with a denominator of a power of 10 (10, 100, 1000, etc.) is a decimal fraction. A decimal fraction can be converted into a decimal. Decimals represent the same part of a whole as a fraction. There are place values less than the ones place that show numbers less than a whole. These are the tenths and hundredths place. The digits in a decimal have a value. Decimals and fractions can be represented in multiple ways. Using equivalent fractions can help you add tenths and hundredths together. Decimals can be compared.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	Fractions with denominators of 10, 100, 1000, etc. are decimal fractions. Decimal fractions can be written as a decimal. Fractions have decimal equivalents and decimals have fractional equivalents. There are place values less than one. These are your tenths, hundredths, etc.

DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Use (base ten blocks or graph paper to model fractions with denominators of 10 or 100.) Express (a fraction with a denominator of 10 as an equivalent fraction with a denominator of 100.) Generate (equivalent fractions to add fractions with denominators of 10 and 100.) Add (two fractions with denominators of 10 and 100.) Make (a connection between fractions with denominators of 10 and 100 and decimals/the place value chart.) Read (decimal fractions with denominators of tenths and hundredths.) Write (decimal fractions with denominators of tenths and hundredths.) Convert (decimal fractions into decimals.) Decompose (decimals. For example, 0.32=3/10 and 2/100.) Read (decimals in the tenths and hundredths.) Write (decimals in the tenths and hundredths.) Represent (decimals on a number line.) Build (area models to compare decimals.) Compare (decimals including tenths and hundredths.)

Academic Vocabulary

Academic Vocabulary

- **Addition:** The operation of combining to find the total amount
- **Compare:** To determine how numbers, objects, or shapes are alike or different
- **Decimal:** The numbers in the base 10 number system having one or more places to the right of the decimal point
- **Decimal fraction:** A fraction that has a base ten denominator (ex. 10, 100, 1000, etc.)
- **Decimal point:** The notation in a number distinguishing between whole numbers and fractional parts. The dot used to separate the ones place from the tenths place in a decimal number.
- **Decompose:** Breaking numbers into tens and ones; breaking wholes into parts
- **Denominator:** The bottom portion in a fraction that describes the number of pieces of the whole
- **Equivalent fractions:** Two fractions that are equal in size
- **Fraction:** A number expressible in the form a/b where a is a whole number and b is a positive whole number
- **Hundredths:** The next largest unit a decimal can be broken up into after tenths
- **Number Line:**
- **Numerator:** The top portion in a fraction that describes the number of parts of a whole
- **Part:** A portion of an object
- **Sum:** The answer to an addition problem.
- **Tenths:** The largest unit a decimal can be broken up into. The first number to the right of the decimal point.
- **Whole:** An entire object

- **Whole number:** The numbers 0, 1, 2, 3…

Interdisciplinary Connections

Everyday Places You Can Explore Decimals:
Money, prices at a store, gas pumps, measurement, nutrition information on packages, traffic signs, grocery stores, unit prices, etc.

Science:
Students can examine average temperatures for different states that are listed to the tenths place and order the temperatures.

Physical Education:
Students can use stop watches to time a partner how long it takes to run a particular distance. Students can time races using either tenths or hundredths of a second on the stopwatch. Then, students can rank the times from fastest to slowest using their knowledge of decimals.

Tools/Manipulatives

Base ten Blocks
Graph paper
10 x 10 grids
Crayons, Colored Pencils or Markers
Play Money (dollar bills, pennies, and dimes)
Numbered cards
Dice
Number Lines

Suggested Formative Assessment Practices/Processes

- Most of the above mentioned activities can be created into a mini-assessment that can be completed independently and handed in for a grade.
- Exit Slips that ask a question related to the specific topic being taught that day/week.
- Math Journal responses
- Daily Student work
- Anecdotal records as you observe students working during activities and lessons.

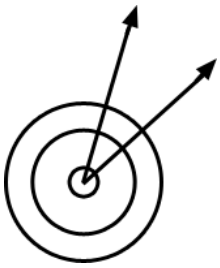
Math Grade 4

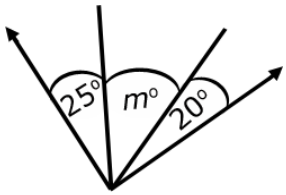
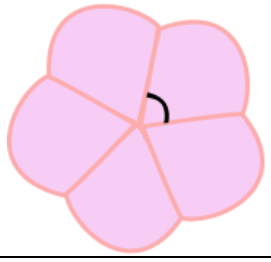
Grade/Subject	Grade 4 Mathematics
Unit Title	Unit 5: Geometry
Overview of Unit	The conceptual focus of this unit is geometry. Students will learn to identify lines and angles, create shapes by properties of their lines and angles, recognize lines of symmetry, and measure angles in order to develop spatial reasoning. Their new learning will enable them to construct a map of Geometry Town, demonstrating their understanding of geometric properties
Pacing	5 Weeks

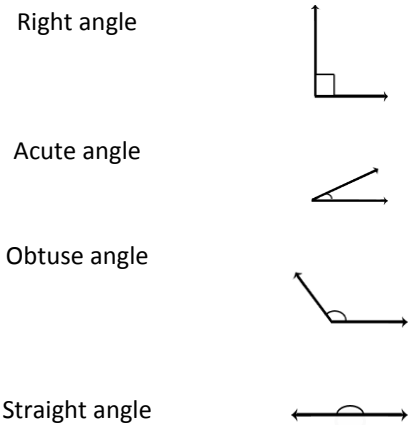
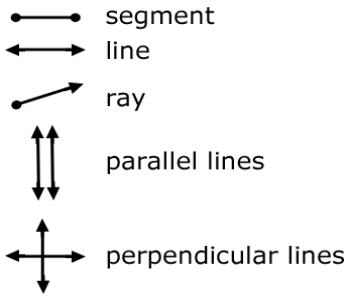
Essential Questions (and Corresponding Big Ideas)

Essential Questions

- **How can you describe the world geometrically?** All shapes and objects of the world have geometric properties.
- **How can the properties of shapes help you understand the world?** Knowing the properties of shapes helps us design our world.
- **How can math tools help us in our lives?** Math tools, such as rulers or protractors, can help us attend to precision.
-

Core Content and Practice Standards	Explanations and Examples*
4.MD.5 Recognize angles as geometric shapes that are formed whenever 2 rays share a common endpoint, and understand concepts of angle measurement: • An angle us measured in reference to a circle with its center at the common endpoint of the rays, by considering the fraction of a circular arc between points where two rays intersect the circle. An angle that turns 1/360 of a circle is called a "one degree angle" and can be used to measure angles. • An angle turns through one n degrees is said to have an angle that measures n degrees.	**4.MD.5** The diagram below will help students understand that an angle measurement is not related to an area since the area between the 2 rays is different for both circles yet the angle measure is the same. 
4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	**4.MD.6** Before students begin measuring angles with protractors, they need to have some experiences with benchmark angles. They transfer their understanding that a 360º rotation about a

	point makes a complete circle to recognize and sketch angles that measure approximately 90º and 180º. They extend this understanding and recognize and sketch angles that measure approximately 45º and 30º. They use appropriate terminology (acute, right, and obtuse) to describe angles and rays (perpendicular).
4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram, in real world and mathematical problems, e.g. by using an equation with a symbol for the unknown angle measure.	4.MD.7 Examples If the two rays are perpendicular, what is the value of m?  Examples: • Joey knows that when a clock's hands are exactly on 12 and 1, the angle formed by the clock's hands measures 30º. What is the measure of the angle formed when a clock's hands are exactly on the 12 and 4? • The five shapes in the diagram are the exact same size. Write an equation that will help you find the measure of the indicated angle. Find the angle measurement. 

4.G.1 Draw points, lines, line segments, rays, angles,(right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**4.G.1** Examples of points, line segments, lines, angles, parallelism, and perpendicularity can be seen daily. Students do not easily identify lines and rays because they are more abstract.  
4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	**4.G.2** A possible justification that students might give is: The square has perpendicular lines because the sides meet at a corner, forming right angles. This expectation is closely connected to 4.MD.5, 4.MD.6, and 4.G.1. Students' experiences with drawing and identifying right, acute, and obtuse angles support them in classifying two-dimensional figures based on specified angle measurements. They use the benchmark angles of 90°, 180°, and

	360° to approximate the measurement of angles. Right triangles can be a category for classification. A right triangle has one right angle. There are different types of right triangles. An isosceles right triangle has two or more congruent sides and a scalene right triangle has no congruent sides.
4.G.3 Recognize a line a symmetry for a two dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**4.G.3** Students need experiences with figures that are symmetrical and non-symmetrical. Figures include both regular and non-regular polygons. Folding cut-out figures will help students determine whether a figure has one or more lines of symmetry.

ISTE Standards
http://www.iste.org/standards/nets-for-students.aspx • nets.s.1.a • nets.s.2.a • nets.s.2.b • nets.s.4.b

K-U-D	
KNOW *Facts, formulas, information, vocabulary*	Vocabulary: *lines, line segments, rays, points, endpoints, vertex, angles (acute, right, obtuse, straight), degrees, protractor, circle, two-dimensional figures, symmetry, parallel lines, perpendicular lines, intersecting lines, right triangle, acute triangle, obtuse triangle.* Angles can be classified by their measurements. Protractors are a tool that helps us construct and measure angles. There are four different types of angles. These include right, acute, obtuse, and straight angles. Triangles can be classified by their angles. Shapes and designs can be symmetrical Shapes, lines, and angles are defined by their properties Math tools can help solve problems Precision is important when measuring angles.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	The situation determines the tools to be used and the level of precision that is required. The properties of geometric figures determine their application in the real world.

DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Classify (angles including acute, right, obtuse, and straight.) Construct (angles including acute, right, obtuse, and straight.) Measure (angles including acute, right, obtuse, and straight.) Construct (lines, line segments, rays, and two-dimensional shapes.) Identify and draw (lines of symmetry) Recognize (line-symmetric shapes.) Classify (two-dimensional shapes based on properties of lines and/or angles.) Recognize (angles as geometric shapes.) Attend (to precision when measuring angles with a protractor).

Academic Vocabulary

Academic Vocabulary

Acute angle-an angle measuring less than 90 degrees
Acute triangle-a triangle with three acute angles
Angle-a figure made by two rays that extend from the same point
Complementary Angle- two angles that add up to 90 degrees
Decompose-the process of separating numbers / shapes into smaller parts
Degree-a unit of measure for temperature and for angles
Endpoint- a point at the end of a line segment or ray
Hexagon-a six sided figure
Horizontal – going side to side, like the horizon
Irregular Polygon- a polygon that does not have all sides equal or all angles equal
Line- a straight path that extends infinitely in opposite directions
Line of symmetry-a line that divides a figure into halves, making a mirror image
Line segment- a part of a line with two endpoints
Measure-to find the size, weight, or capacity
Measurement-the size, amount, quantity, capacity, or degree expressed in standard units
Obtuse angle-and angle greater than 90 degrees and less than 180 degrees
Obtuse triangle- a triangle with an obtuse angle
Parallel lines-two lines that never intersect
Parallelogram-a quadrilateral with opposite sides that are parallel and congruent
Pentagon- a five sided shape
Perpendicular lines- lines that intersect at one point and form right angles
Point- an exact location is space
Polygon-a closed figure made from line segments
Precision- the quality, condition, or the fact of being exact and accurate
Property-a characteristic about numbers or geometric figures that is always true
Protractor-a tool used to measure angles
Quadrilateral- a four sided shape
Ray- a part of a line that has one endpoint and extends forever in the other direction
Rectangle-a two-dimensional, four sided shape with four right angles
Regular Polygon- A polygon that has all sides equal and all angles equal

Rhombus-a parallelogram whose four sides and angles are congruent
Right angle- an angle with a measurement of 90 degrees
Right triangle-a triangle with one right angle
Side-one of the line segments that forms a polygon
Square-a special rectangle with four equal sides
Straight Angle- An angle of 180 degrees
Supplementary Angle- two angles that add up to 180 degrees
Symmetry-having the same size and shape across a dividing line
Trapezoid-a quadrilateral with exactly one pair of parallel sides
Triangle-a two-dimensional, three sided shape
Two-dimensional figure- a plane figure with length and width
Vertex-a corner or point where two lines meet
Vertical – in an up/down position, like a tree

- **Width**-the distance across from side to side

Interdisciplinary Connections

Art:
Analyze abstract art to find examples of geometric shapes and properties
Analyze symmetry in art.
Create symmetric drawings or designs.

Science:
Identify symmetry in nature.

Physical Education:
Use kinesthetic movements to create angles and lines

Tools/Manipulatives

Tangrams
Pattern Blocks
"I Have, Who Has?" game
Popsicle sticks or similar
Pom-poms
Mini-marshmallows
Toothpicks
Straws
Fasteners
Maps
Construction paper
Scissors
Clock
Protractor
Bulletin board

Computer
A straight edge (example: ruler)
Colored pencils
Pencil
Paper
Geoboards
Rubber bands

Suggested Formative Assessment Practices/Processes

- Exit Slips that ask a question related to the specific topic being taught that day/week.
- Math Journal responses
- Daily Student work
- Interactive Response Systems

Grade/Subject	Grade 4 Mathematics
Unit Title	Unit 6: Operations with Fractions
Overview of Unit	In this unit, students will be operating with fractions by applying and extending their understandings of operations on whole numbers. Students will use visual fraction models to compose and decompose fractions to add, subtract, and multiply fractions. They will be adding and subtracting fractions with common denominators by joining and separating parts referring to the same whole. They will also be adding and subtracting mixed numbers. Since students will have experiences with mixed numbers and fractions greater than one (improper fractions), they will learn how to create equivalent models to help them add and subtract. Students will also decompose a fraction into the sum of fractions with the same denominator in more than one way. Students will also learn to multiply a fraction by a whole number. Once students learn how to operate with fractions, they will solve word problems involving the addition, subtraction, and multiplication of fractions.
Pacing	6 weeks

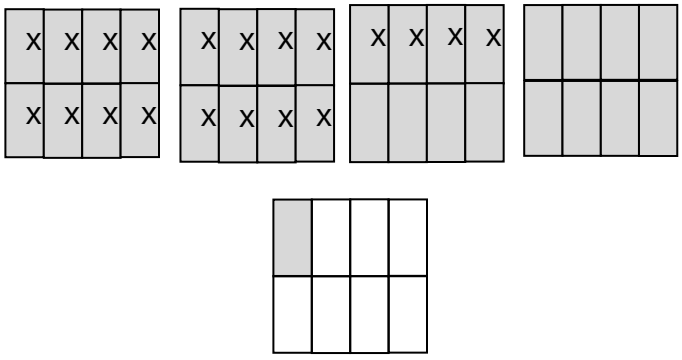
Essential Questions (and Corresponding Big Ideas)

Essential Questions

- **How can fractions be represented in different ways?** Fractions can be represented in various ways. Equivalent fractions represent the same part of a whole. Fractions can also be written as a mixed number or an equivalent fraction greater than one (improper fractions).
- **What strategies can I use to operate on fractions?** When adding, subtracting, or multiplying fractions there are various strategies to use. I can use visual fraction models to compose and decompose fractions**.** I can convert a mixed number to an equivalent fraction greater than one that can help me operate on fractions.
- **How do we apply our understanding of fractions in everyday life?** Knowing how to operate on fractions can help me in my everyday life. I use fractions in baking, measuring, constructing, etc. Learning how to add, subtract, and multiply fractions will help me in my daily life.

Core Content and Practice Standards	Explanations and Examples*
4.NF.3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. a. Understand addition and subtraction of fractions as	A fraction with a numerator of one is called a unit fraction. When students investigate fractions other than unit fractions, such as 2/3, they should be able to decompose the non-unit fraction into a combination of several unit

joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: $3/8=1/8+1/8+1/8$; $3/8=1/8+2/8$; $2\ 1/8=1+1+1/8=8/8+8/8+1/8$.* c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.	fractions. Example: 2/3 = 1/3 + 1/3 Being able to visualize this decomposition into unit fractions helps students when adding or subtracting fractions. Students need multiple opportunities to work with mixed numbers and be able to decompose them in more than one way. Students may use visual models to help develop this understanding. Example: • 1 ¼ - ¾ = □ 4/4 + ¼ = 5/4 5/4 – ¾ = 2/4 or ½ Example of word problem: • Mary and Lacey decide to share a pizza. Mary ate 3/6 and Lacey ate 2/6 of the pizza. How much of the pizza did the girls eat together? Solution: The amount of pizza Mary ate can be thought of a 3/6 or 1/6 and 1/6 and 1/6. The amount of pizza Lacey ate can be thought of a 1/6 and 1/6. The total amount of pizza they ate is 1/6 + 1/6 + 1/6 + 1/6 + 1/6 or 5/6 of the whole pizza. A separate algorithm for mixed numbers in addition and subtraction is not necessary. Students will tend to add or subtract the whole numbers first and then work with the fractions using the same strategies they have applied to problems that contained only fractions. Example:

	• Susan and Maria need 8 3/8 feet of ribbon to package gift baskets. Susan has 3 1/8 feet of ribbon and Maria has 5 3/8 feet of ribbon. How much ribbon do they have altogether? Will it be enough to complete the project? Explain why or why not. The student thinks: I can add the ribbon Susan has to the ribbon Maria has to find out how much ribbon they have altogether. Susan has 3 1/8 feet of ribbon and Maria has 5 3/8 feet of ribbon. I can write this as 3 1/8 + 5 3/8. I know they have 8 feet of ribbon by adding the 3 and 5. They also have 1/8 and 3/8 which makes a total of 4/8 more. Altogether they have 8 4/8 feet of ribbon. 8 4/8 is larger than 8 3/8 so they will have enough ribbon to complete the project. They will even have a little extra ribbon left, 1/8 foot. Example: Trevor has 4 1/8 pizzas left over from his soccer party. After giving some pizza to his friend, he has 2 4/8 of a pizza left. How much pizza did Trevor give to his friend? Solution: Trevor had 4 1/8 pizzas to start. This is 33/8 of a pizza. The x's show the pizza he has left which is 2 4/8 pizzas or 20/8 pizzas. The shaded rectangles without the x's are the pizza he gave to his friend which is 13/8 or 1 5/8 pizzas. 

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

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

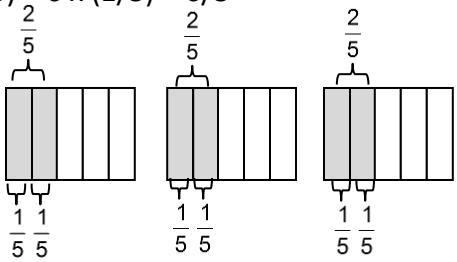
b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$.* (*In general, $n \times (a/b) = (n \times a)/b$.*)

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

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

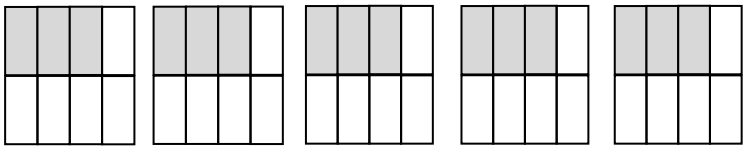
Examples:

- 3 x (2/5) = 6 x (1/5) = 6/5

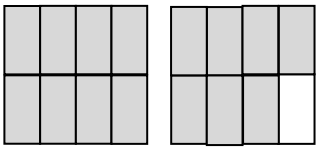


- If each person at a party eats $3/8$ of a pound of roast beef, and there are 5 people at the party, how many pounds of roast beef are needed? Between what two whole numbers does your answer lie?

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



3/8 3/8 3/8 3/8 3/8



3/8 + 3/8 + 3/8 + 3/8 + 3/8 = 15/8 = 1 7/8

Standards for Mathematical Practice (SMP) **1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. **5. Use appropriate tools strategically.** 6. Attend to precision. **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**	

ISTE Standards

(http://www.iste.org/standards/nets-for-students.aspx)

- NETS.S.1.c: *Students demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology: Use models and simulations to explore complex systems and issues*
- NETS.S.3.a: *Students apply digital tools to gather, evaluate, and use information: Plan strategies to guide inquiry*
- NETS.S.3.b: *Students apply digit tools to gather, evaluate, and use information: Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media*.

K-U-D

KNOW *Facts, formulas, information, vocabulary*	*Vocabulary: part, whole, fraction, unit fraction, denominator, like denominator, numerator, equivalent fraction, operations, sum, addition, add, join, compose, difference, subtraction, subtract, decompose, produce, multiplication, multiply, multiple, factor, visual fraction model, mixed number, fraction greater than one, improper fraction, convert*

	Fractions can be built from the sum of their unit fractions. (Example: 3/8= 1/8 +1/8+ 1/8) Fractions can be decomposed in a variety of ways using the same denominator. (Example: 4/5= 1/5+ 1/5+1/5+ 1/5+1/5 or 2/5+1/5+1/5+1/5 or 2/5+3/5, etc.) When adding fractions, you are joining parts referring to the same whole. When subtracting fractions, you are separating parts referring to the same whole. Fractions greater than one (improper fraction) can be converted to an equivalent mixed number. A mixed number can be converted to an equivalent fraction greater than one (improper fraction) Fractions and mixed numbers can be added and subtracted. A fraction can be multiplied by a whole number.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	Numbers can be represented in various ways. Fractions can represent an amount less than or greater than one whole. All fractions can be broken down into multiples of their unit fractions. The operations of addition, subtraction, and multiplication can be applied to fractions. A mixed number can be represented as an equivalent fraction greater than one.
DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Express (a/b with a numerator greater than one as the sum of fractions 1/b) Add (fractions referring to the same whole with like denominators) Subtract (fractions referring to the same whole with like denominators) Decompose (a fraction, including fractions greater than one into the sum of fractions with the same denominator) Add (mixed numbers by finding an equivalent fraction greater than one) Subtract (mixed numbers by finding an equivalent fraction greater than one) Solve (word problems involving the operations of addition and subtraction of fractions) Convert (mixed numbers to fractions greater than one) Convert (fractions greater than one to a mixed number) Understand (fraction a/b as a multiple of 1/b) Multiply (a fraction by a whole number) Multiply (a whole number by a fraction) Solve (word problems involving multiplication of a fraction by a whole number) Use (visual fraction models to add, subtract, and multiply fractions)
Academic Vocabulary	

- **Addition:** The operation of combining to find the total amount
- **Common denominator:** a denominator that is the same in two or more fractions
- **Compare:** To determine how numbers, objects, or shapes are alike or different
- **Compose:** joining numbers to create tens, joining parts to make a whole
- **Decompose:** Breaking numbers into tens and ones; breaking wholes into parts
- **Denominator:** The bottom portion in a fraction that describes the number of pieces of the whole
- **Difference:** the answer to a subtraction problem
- **Equation:** a number sentence that uses the equal sign to show that two amounts are equal
- **Equivalent fractions:** Two fractions that are equal in size
- **Fraction:** A number expressible in the form a/b where a is a whole number and b is a positive whole number
- **Fraction Greater than One:** An improper fraction representing an amount greater than one
- **Improper Fraction:** a fraction whose numerator is greater than or equal to its denominator
- **Mixed Number:** a number made up of a whole number and a fraction
- **Multiple:** the product of a given number and any whole number
- **Multiplication:** the operation of repeated addition of the same number
- **Numerator:** The top portion in a fraction that describes the number of parts of a whole
- **Operation:** an arithmetic procedure used to solve a mathematical problem, such as addition, subtraction, multiplication, or division
- **Part:** A portion of an object
- **Product:** the answer to a multiplication problem
- **Subtraction:** the operation of taking part away from the whole
- **Sum:** The answer to an addition problem.
- **Unit Fraction:** a fraction that has one as its numerator
- **Whole:** An entire object
- **Whole number:** The numbers 0, 1, 2, 3…

Interdisciplinary Connections

Physical Education:
Students can easily add, subtract, and multiply fractions in P.E.

Cooking:
Students can read recipes involving fractions and add, subtract, and multiply the ingredients based on questions asked.

Wood Shop/Building:
Students will have to measure lengths of wood/lumber in fractions of an inch and then operate to find the total amounts of wood needed to make something (for example: a bird house).

Tools/Manipulatives

Centimeter grid paper
Graph paper
Cuisenaire rods
Crayons, Colored Pencils or Markers
Numbered cards
Dice
Number Lines
Fraction bars
Math journals
Paper
Pattern blocks

Suggested Formative Assessment Practices/Processes

- Create practice performance tasks that require students to utilize their knowledge of adding, subtracting, and multiplying fractions.
- Create a formative test that tests any of the skills taught in this unit in isolation to ensure understanding of topic.
- Most of the above mentioned activities can be created into a mini-assessment that can be completed independently and handed in for a grade.
- Exit Slips that ask a question related to the specific topic being taught that day/week.
- Math Journal responses
- Daily Student work
- Anecdotal records as you observe students working during activities and lessons.

Grade/Subject	Grade 4 Mathematics
Unit Title	Unit 7: Solving Problems with Measurement and Data
Overview of Unit	This unit extends students' previous experiences with measurement and data. One topic this unit addresses is measurement conversions. Students will use all four operations to solve word problems involving measurement and conversions of measurements in the same system. They will convert from a larger unit to a smaller unit. Students will be working in both metric and customary units. They will convert units of measurement for length, liquid volume, mass, and time. This unit also addresses the formula for finding the area and perimeter of rectangles in real-world and mathematical problems. Finally, students will learn how to make a line plot to display a data set of measurements in fractions of a unit.
Pacing	6 weeks

Essential Questions (and Corresponding Big Ideas)

Essential Questions

- **How do I determine the best unit of measurement?** Knowing the relative size of all units of measurement in both the metric system and customary units will help select the best unit of measurement.
- **How are units in the same system of measurement for distance, weight, capacity, time, etc. related?** In the metric system, units of measurement are modeled after our base-ten number system. Knowing this, will help convert from smaller to larger or larger to smaller units in the metric system. Likewise, there are set proportions in customary units that will help convert units of measurement.
- **Why do I need to convert between units of measurement?** In the real world, measurement conversions happen all the time. Real world examples include baking, sewing, building, woodworking, etc.
- **How are area and perimeter related?** The perimeter of a rectangle is the distance around the rectangle. The area of a rectangle is the space inside the rectangle. To calculate either one, you need the length and the width of the rectangle.

Core Content and Practice Standards	Explanations and Examples*
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	The units of measure that have not been addressed in prior years are pounds, ounces, kilometers, milliliters, and seconds. Students' prior experiences were limited to measuring length, mass, liquid volume, and elapsed time.

<table>
<tr>
<td>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),</td>
<td>Students did not convert measurements. Students need ample opportunities to become familiar with these new units of measure.

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

Example:

<table>
<tr><th>kg</th><th>g</th></tr>
<tr><td>1</td><td>1000</td></tr>
<tr><td>2</td><td>2000</td></tr>
<tr><td>3</td><td>3000</td></tr>
</table>
<table>
<tr><th>ft</th><th>in</th></tr>
<tr><td>1</td><td>12</td></tr>
<tr><td>2</td><td>24</td></tr>
<tr><td>3</td><td>36</td></tr>
</table>
<table>
<tr><th>lb</th><th>oz</th></tr>
<tr><td>1</td><td>16</td></tr>
<tr><td>2</td><td>32</td></tr>
<tr><td>3</td><td>48</td></tr>
</table>
</td>
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<tr>
<td>4.MD.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</td>
<td>Examples:

<u>Division/fractions:</u> Susan has 2 feet of ribbon. She wants to give her ribbon to her 3 best friends so each friend gets the same amount. How much ribbon will each friend get?

Students may record their solutions using fractions or inches. (The answer would be 2/3 of a foot or 8 inches. Students are able to express the answer in inches because they understand that 1/3 of a foot is 4 inches and 2/3 of a foot is 2 groups of 1/3.)

<u>Addition:</u> Mason ran for an hour and 15 minutes on Monday, 25 minutes on Tuesday, and 40 minutes on Wednesday. What was the total number of minutes Mason ran?

<u>Subtraction:</u> A pound of apples costs $1.20. Rachel bought a pound and a half of apples. If she gave the clerk a $5.00 bill, how much change will she get back?

<u>Multiplication:</u> Mario and his 2 brothers are selling</td>
</tr>
</table>

	lemonade. Mario brought one and a half liters, Javier brought 2 liters, and Ernesto brought 450 milliliters. How many total milliliters of lemonade did the boys have? Number line diagrams that feature a measurement scale can represent measurement quantities. Examples include: ruler, diagram marking off distance along a road with cities at various points, a timetable showing hours throughout the day, or a volume measure on the side of a container.
4.MD.3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor*	Students developed understanding of area and perimeter in 3rd grade by using visual models. While students are expected to use formulas to calculate area and perimeter of rectangles, they need to understand and be able to communicate their understanding of why the formulas work. The formula for area is *l* x *w* and the answer will always be in square units. The formula for perimeter can be 2 *l* + 2 *w* or 2 (*l* + *w*) and the answer will be in linear units.
4.MD.4. Make a line plot to display a data set of measurements in fractions of a unit ($1/2$, $1/4$, $1/8$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*	Example: Ten students in Room 31 measured their pencils at the end of the day. They recorded their results on the line plot below. X X X X X X X X X X _____ 3 ½" 4" 4 ¼" 5 1/8" 5 1/2" Possible questions: • What is the difference in length from the longest to the shortest pencil?

	• If you were to line up all the pencils, what would the total length be? If the 5 1/8" pencils are placed end to end, what would be their total length?
Standards for Mathematical Practice (SMP) **1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. **5. Use appropriate tools strategically.** 6. Attend to precision. **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**	

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K-U-D

KNOW *Facts, formulas, information, vocabulary*	Vocabulary: *area, capacity, centimeter, convert, conversion, cup, cubic unit, customary unit, distance, elapsed time, equivalent, foot, feet, formula, fraction, gallon, gram, height, hour, inch, kilogram, kilometer, length, line plot, liquid volume, liter, mass, measure, measurement, meter, metric system, mile, milliliter, minute,*

	number line, ounce, perimeter, pint, pound, quart, rectangle, second, square, square unit, width, yard There are two systems of measurement: metric and customary. Metric measurements for length are millimeter, centimeter, meter, and kilometer. Metric measurements for liquid volume are milliliter and liter. Metric measurements for mass are gram and kilogram. Customary units for length are inches, feet, yards, and miles. Customary units for liquid volume are cups, pints, quarts, and gallons. Customary units for weight are ounces and pounds. The metric system is a base 10 system. (100 cm =1 m) There are 12 inches in a foot. There are 3 feet in a yard. Perimeter is the distance around a figure. The formula for calculating perimeter is 2l + 2w or 2 (l + w) Perimeter is measured in linear units. Area is the number of square units inside a rectangle. The formula for calculating area is l x w. Area is expressed in square units. Data can be measured and represented on line plots.
UNDERSTAND *Big ideas, generalizations, principles, concepts, ideas that transfer across situations*	There is a relationship between metric units based on powers of ten. There is a relationship between customary units of measurement. Measurements can be converted within the same measurement system. The unit of measurement must be indicated when measuring. The use of standard units makes it easier to communicate measurements. The larger the unit of measurement, the smaller the number obtained as you measure. There is a relationship between the length and width of a rectangle and its area and perimeter. Data can be measured and represented on line plots.
DO *Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)*	Describe (relative sizes of measurement units within one system of units for both customary and metric systems.) Express (measurements in a larger unit in terms of a smaller unit.) Record (measurement equivalents in a 2-column table.) Convert (between units of measurement in the same system of measurement for length, weight, liquid volume, time, and mass.) Solve (word problems involving distance, time, liquid volume, mass, and money.) Represent (measurement quantities using diagrams and number lines.) Apply (the area and perimeter formula for rectangles in real world and mathematical problems.) Calculate (the area and perimeter of a rectangle.) Make (a line plot to display a set of measurements in fractions of a unit.) Solve (problems involving addition and subtraction of fractions by using information presented in line plots.)

Academic Vocabulary
○ **area**: The number of square units needed to cover a surface ○ **capacity**: a measure of the amount of liquid a container will hold ○ **centimeters**: a metric unit used to measure length ○ **convert**: to change from one unit of measurement to another using a conversion factor **conversion**: the process of changing from one form to another form ○ **cup:** a customary unit of measurement for capacity ○ **cubic unit**: a standard unit for measuring volume ○ **customary system**: the measurement system used most often in the United States ○ **distance**: a length between two points or objects ○ **elapsed time:** the amount of time that passes from the start of an activity to the end of an activity ○ **equivalent:** equal in value or amount ○ **foot/feet:** customary unit of measurement for length ○ **formula**: an equation that states a fact or rule expressed by symbols ○ **fraction**: a number that names a part of a whole or part of a group ○ **gallon:** a customary unit used to measure capacity ○ **gram**: a metric unit used to measure mass ○ **height:** the distance from bottom to top ○ **hour:** a unit used to measure time ○ **inch:** a customary unit of measurement for length ○ **kilogram**: a metric unit used to measure mass ○ **kilometer**: a metric unit of measurement for length ○ **length:** the distance from one end of an object to the other end of an object ○ **line plot:** a graph using marks above a number on a number line to show the frequency of data ○ **liquid volume:** the amount of space occupied by a liquid in a container, capacity **liter:** a metric unit used to measure capacity ○ **mass:** the amount of matter in an object ○ **measure:** to find the weight, size, or capacity ○ **measurement:** the size, amount, quantity, capacity, or degree expressed in standard units ○ **meter:** a metric unit used to measure length ○ **metric system**: a measurement system used throughout the world based on multiples of 10 ○ **mile**: a customary unit used to measure length or distance ○ **milliliter**: a metric unit used to measure capacity ○ **minute**: a unit used to measure time ○ **number line**: a line on which points correspond to numbers ○ **ounce:** a customary unit used to measure weight ○ **perimeter**: the distance around a close figure ○ **pint:** a customary unit used to measure capacity ○ **pound**: a customary unit used to measure weight ○ **quart:** a customary unit used to measure capacity ○ **rectangle:** a flat, four-sided shape with four square corners

- **second**: a unit used to measure small units of time
- **square:** a special rectangle with four equal sides
- **square unit:** a unit used to measure area
- **width:** the measure or distance across something from one side to the other
- **yard**: a customary unit used to measure length or distance

Interdisciplinary Connections

Art

- Students can use the concept of perimeter to make a frame for one of their art projects.
- Students can use square units (inches, centimeters) to make a quilt out of construction paper/wall paper and calculate the area and perimeter.

Physical Education:

- During fitness testing, students can measure how many centimeters/inches they can reach during the sit and reach.
- They can measure how far they can throw different objects. (frisbees, balls, etc.)

Cooking:

- Students can read recipes that contain measurements (cups, pints, etc.) and convert between different units.

Wood Shop/Building:

- Students will have to measure lengths of wood/lumber in fractions of an inch and then operate to find the total amounts of wood needed to make something (for example: a bird house).

Tools/Manipulatives

Rulers
Yard sticks
Meter sticks
Measuring tapes
Balance scales
Kitchen scales
Liquid containers such as empty gallons of milk, quart of milk, pint of creamer, etc.
Graph paper
Geoboards
Rubber bands
Clocks
Stop watches
Construction paper
Tangrams

Suggested Formative Assessment Practices/Processes
• Most of the above lessons can be used as a starting point to make a quick formative assessment to let you know students' understanding of the topic. • Exit slips with a focused question directly related to the lesson work well for a quick assessment. • Create practice performance tasks that require students to utilize their knowledge of measurement and conversions. • Create a formative test that tests any of the skills taught in this unit in isolation to ensure understanding of topic. • Math Journal responses • Daily Student work • Anecdotal records as you observe students working during activities and lessons.