Desired Outcomes

Standard(s):

Use the four operations with whole numbers to solve problems.

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

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

Generalize place value understanding for multi-digit whole numbers.

4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division*.

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.

Gain familiarity with factors and multiples.

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

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

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

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

Use the four operations with whole numbers to solve problems.

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

Transfer: Students will apply concepts and procedures for adding, subtracting, multiplying and dividing multi-digit whole numbers to solve real-world and mathematical problems.

Ex: A basketball costs 3 times as much as a tennis ball. If the tennis ball costs $4, how much does a basketball cost?

Ex: The dimensions of a small-size soccer field are 65 yards by 45 yards. What is the area of the soccer field?

Understandings: *Students will understand that …*

- Place value is based on groups of ten and the value of a number is determined by the place of its digits.
- Whole numbers are read from left to right using the name of the period; commas are used to separate periods.
- A number can be written using its name, standard, or expanded form.
- Flexible methods of computation involve grouping numbers in strategic ways.
- The distributive property is connected to the area model and/or partial products method of multiplication.
- Multiplication and division are inverse operations.
- There are three different structures for multiplication and division problems: Area/Arrays, Equal Groups, and Comparison, and the unknown quantity in multiplication and division situations is represented in three ways: Unknown Product, Group Size Unknown, and Number of Groups Unknown
- Some division situations will produce a remainder, but the remainder should always be less than the divisor. If the remainder is greater than the divisor, that means at least one more can be given to each group (fair sharing) or at least one more group of the given size (the dividend) may be created. When using division to solve word problems, how the remainder is interpreted depends on the problem.

Essential Questions:

- How does the position of a digit in a number affect its value, and how can the values of digits be used to compare two numbers?
- In what ways can numbers be composed and decomposed?
- How are the factors of a number determined?
- What is the difference between a prime number and composite number?
- How are multiplication and division related?
- What are efficient methods for finding products and quotients?
- How are dividends, divisors, quotients, and remainders related?
- What real-life situations require the use of multiplication or division?
- How does a remainder affect the answer in a division word problem?

Highlighted Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them.** Students will solve word problems using all operations. Students will represent word problems using various modalities. Students will demonstrate their perseverance by selecting an effective modality to solve problems.

* 2. **Reason abstractly and quantitatively.** Students determine what operations to use to solve word problems and think about the reasonableness of their solutions. Students use reasonable estimates based upon the value of the numbers.

3. **Construct viable arguments and critique the reasoning of others.** Students demonstrate their ability to construct viable arguments when they talk and write about the steps they take to solve problems. Students restate and respond to each other about their mathematical thought processes.

* 4. **Model with mathematics.** Students write equations when recording all steps used to solve multiplication and division problems. They use multiple modalities (such as pictures, manipulatives, written symbols, real world situations, oral/written language) when representing a situation.

5. **Use appropriate tools strategically.** Students choose and use the appropriate tools to solve problems. Tools might include: color tiles, base ten blocks, counters, math lines, geoboards, Unifix® cubes, websites, formulas, numerical equations, numerical expressions, diagrams, graph paper, shape diagrams, whiteboards.

6. **Attend to precision.** Students demonstrate precision in calculation by using inverse operations to check their work and by using precise vocabulary in their oral and written explanations.

* 7. **Look for and make use of structure.** Students recognize and identify patterns existing between addition and multiplication along with division and subtraction. Students use this knowledge when applying strategies to evaluate real-world problems such as area and perimeter. They also use problem solving structures to aid in solving real world problems.

8. **Look for and express regularity in repeated reasoning.** Students identify and explain patterns within multiplication and division arrays (prime numbers, square numbers, and composite numbers, factors, multiples), determine and communicate whether identified patterns always work, determine when to apply specific patterns, describe the relationship between multiplication, addition, subtraction, and division, and justify that their solutions make sense (e.g., using mental computation and/or estimation).

Prerequisite Skills/Concepts: *Students should already be able to…* • Add and subtract fluently within 1000 • Read and write numbers to 1000 using base-ten numerals, number names, and expanded form • Compare two three-digit numbers • Apply properties of operations to solve problems • Interpret products and quotients of whole numbers • Solve word problems involving multiplication and division with equal groups, arrays, and measurement • Determine unknowns in multiplication and division equations • Understand division as unknown factor problems • Fluently multiply and divide within 100 • Multiply 1-digit numbers by multiples of 10 • Solve two-step word problems involving addition, subtraction, multiplication, and division	**Advanced Skills/Concepts:** *Some students may be ready to…* • Multiply larger than 2 digit by 2 digit numbers • Divide by multiples of ten • Solve problems involving multi-step equations with two or more operations • Create multi-step problems using a variety of problem-solving structures • Use parentheses to represent and solve multi-step problems
Knowledge: *Students will know…* • Multiplication equations can show comparisons (4.OA.1) • When to apply single equations or more than one equation using manipulatives, and/or diagrams to represent multiplicative comparison. (4.OA.1) • Verbal statements of multiplicative comparisons can be written as equations with and without variables. (i.e. Sally is five years old. Her mom is eight times older. How old is Sally's Mom? 5 x 8 = 40) (4.OA.1) • A digit in one place represents ten times what it represents in the place to its right, by using manipulatives, pictures, language, and/or equations to explain their reasoning. (4.NBT.1)	**Skills:** *Students will be able to …* • Translate comparative situations into drawings and equations with a symbol for the unknown and unknowns in all 3 locations. (4.OA.2) • Solve word problems involving multiplicative comparison using drawings and equations with a symbol for the unknown number and unknowns in all 3 locations. (4.OA.2) • Explain the difference between additive comparison and multiplicative comparison using visuals and words. (4.OA.2) • Read and write whole numbers up to a million using standard, word, and expanded form. (4.NBT.2) • Compare two multi-digit (up to a million) numbers. (4.NBT.2) • Use manipulatives, pictures, and language to show the relationship between the numerals and their place value representations in multiple ways. (4.NBT.2) • Identify all factor pairs for any given number 1-100. Recognize that a whole number is a multiple of each of its factors. (4.OA.4) • Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. (4.OA.4)

• Strategies for multiplying and dividing based on place value, the properties of operations, and/or the relationship between multiplication and division. (4.NBT.5) (4.NBT.6)	• Determine whether a given whole number in the range 1-100 is prime or composite. (4.OA.4) • Use visuals, symbols and/or language to explain their reasoning. (4.OA.4) • Multiply up to 4-digit by 1-digit numbers and 2-digit by 2-digit numbers. (4.NBT.5) • Use place value manipulatives to represent multiplication calculations. Illustrate and explain the calculation by using written equations, rectangular arrays, and area models. (4.NBT.5) • Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors. Illustrate and explain the calculation by using written equations, rectangular arrays, and area models. (4.NBT.6) • Use place value manipulatives to represent division calculations. (4.NBT.6) • Use the relationship between multiplication and division to explain calculations. (4.NBT.6) • Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations and represent those problems using equations with a variable standing for the unknown quantity. Interpret remainders when solving multi-step word problems (4.OA.3) • Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3)

WIDA Standard:

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

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- The use of visuals to make explicit connections between the vocabulary and the content being learned.

Academic Vocabulary:	
Critical Terms: Multiplicative comparison Standard Form Written Form Expanded Form Factor Multiple Prime Composite Divisor Dividend Remainder	**Supplemental Terms:** Array Area Model Equation Product Quotient

Assessment

Summative Assessments

Multiplicative Comparison
Place Value-Video Game Task
Factors and Multiples
Multiplication and Division
Bakery Task

Pre-Assessments	Formative Assessments	Self-Assessments
• Two-Step Word Problems	• Multiplicative Comparison Card Deck • What's My Place • Number of the Day • Place Value Spoons • Read It-Write It Comparison Sentences • Models for Multiplication • Multiplication Fluency Centers • Models for Division • Division Fluency Centers • Interpreting Remainders • Dozens for My Cousins • Gallery Walk	• Place Value Skeleton • Multiplication and Division Self –Assessment Skeleton

Grade 4 **Unit 2: Fractions Equivalence and Operations**

(October, November, and December)

Desired Outcomes

Standard(s):

Extend understanding of fraction equivalence and ordering.

4.NF.1 Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x 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.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

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

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 and the product 5 x (1/4), recording the conclusion by the equation 5/4 = 5 x (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 x (2/5) as 6 x (1/5), recognizing this product as 6/5. (In general, n x (a/b) = (n x 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?

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

Represent and interpret data.

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.

Transfer:

Students will apply concepts and procedures to determine fraction equivalence and compare fractions.

EX: If Sheila ate 4/8 of a candy bar and Robert ate ½ of an equal sized candy bar. Did one person eat more than the other? Justify your reasoning.

They will use their understanding of unit fractions to add and subtract fractions and mixed numbers with like denominators in real world and mathematical problems.

EX: A cookie recipe calls for ¾ cup of sugar, ¼ cup of brown sugar, and 2/4 cup of chocolate chips. How many cups of dry ingredients are need to make the cookies?

Understandings: *Students will understand that …*

- Fractions can be represented visually and in written form.
- Comparisons are valid only when the two fractions refer to the same whole.
- Fractions and Mixed Numbers are composed of unit fractions and can be decomposed as a sum of unit fractions.
- Improper Fractions and Mixed Numbers represent the same value.
- Addition and subtraction of fractions involves joining and separating parts referring to the same whole.
- A product of a fraction times a whole number can be written as a multiple of a unit fraction.
- When converting measurements within one system, the size, length, mass, volume of the object remains the same.

Essential Questions:

- How are fractions used in problem-solving situations?
- How are fractions composed, decomposed, compared and represented?
- Why is it important to identify, label, and compare fractions as representations of equal parts of a whole or of a set?
- How can multiplying a whole number by a fraction be displayed as repeated addition (as a multiple of a unit fraction)?
- Why does the size, length, mass, volume of an object remain the same when converted to another unit of measurement?

Highlighted Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them.** Students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems.

* 2. **Reason abstractly and quantitatively.** Fourth graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions.

* 3. **Construct viable arguments and critique the reasoning of others.** In fourth grade, students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.

4. **Model with mathematics.** Students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections.

5. **Use appropriate tools strategically.** Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use fractions tiles, visual fraction models, equations, or a number line to add and subtract fractions.

6. **Attend to precision.** As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.

* 7. **Look for and make use of structure.** Students look for structure of fractions and mixed numbers when operating on them. They will decompose mixed numbers in order to multiply them by whole numbers, using the distributive property. Students will also use their understanding of fractions as composed of unit fractions in order to add, subtract and multiply fractions.

* 8. **Look for and express regularity in repeated reasoning.** Students use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Prerequisite Skills/Concepts: *Students should already be able to…* • Understand fractions as numbers • Represent fractions on a number line • Explain equivalence and compare fractions using visual fraction models • Fluently add and subtract whole numbers • Use a ruler to measure to the nearest ¼, ½, and whole of an inch • Display data on a line plot	**Advanced Skills/Concepts:** *Some students may be ready to…* • Add and subtract fractions and mixed numbers with unlike denominators using visual fraction models • Solve word problems requiring the use of equivalent fractions
Knowledge: *Students will know…* • A fraction a/b is equivalent to a fraction (n x a)/(n x b). (4.NF.1) • Fractions with different denominators can be compared by using visual fraction models, benchmark fractions, finding common denominators, and finding common numerators. (4.NF.2) • Addition and subtraction of fractions as joining and separating parts referring to the same whole using manipulatives, pictures, symbols, language, and real-life examples. (4.NF.3)	**Skills**: *Students will be able to …* • Recognize and generate equivalent fractions (4.NF.1) • Compare 2 fractions with different denominators and different numerators by representing the fractions with symbols, visual models and words and by comparing to a benchmark fraction using symbols, visual models and words. (4.NF.2) • Identify if comparisons are valid or invalid and explain why. (4.NF.2) • Represent unit fractions as a fraction with a numerator of 1 with manipulatives, pictures, symbols, language, and real-life examples. (4.NF.3) • 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. (4.NF.3) • Add and subtract mixed numbers with like denominators and model the decomposition of the mixed numbers into unit fractions using manipulatives, pictures, symbols, language, and real-life examples. (4.NF.3) • Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators using visual models and/or equations. (4.NF.3) • Represent multiplication of a fraction by a whole number as repeated addition using area or linear models. (4.NF.4) • Represent that a fraction, such as ¾, is made up of 3 unit fractions of ¼ using a multiplication equation, such as 3 x ¼ = ¾(4.NF.4). • Multiply a fraction by a whole number by decomposing the fraction into a multiple of a unit fraction such as ¾ x 2 = 3 x 2 x ¼ which equals 6/4, using manipulatives, pictures, symbols, language, and real-life examples. (4.NF.4)

	• Represent improper fractions with visual models to demonstrate their relationship to the two closest whole numbers. (4.NF.4) • Solve word problems involving multiplication of any fraction by a whole number by using visual models and/or equations. (4.NF.4) • Identify relative sizes of measurement units within one system (customary) of units including lb., oz; hr, min, sec (4.MD.1) • Represent the larger unit of measure in terms of the smaller unit of measure within the same measurement system (customary), including lb., oz; hr, min, sec. using manipulatives, pictures, language and/or equations. (4.MD.1) • Record customary measurement equivalents in a two column table. (4.MD.1) • Use pictures and equations to represent and solve addition, subtraction, multiplication and division word problems involving distance, elapsed time, liquid volumes, and masses of objects (customary system). (4.MD.2) • Measure objects to the nearest ½, ¼ or 1/8 of a unit. (4.MD.4) • Make a line plot to display a set of measurements to the nearest ½, ¼ or 1/8 of a unit. (4.MD.4) • Solve problems involving addition and subtraction of fractions by using information presented in line plots. (i.e. range) (4.MD.4)

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English language learners benefit from:

- A preview of critical vocabulary terms before instruction.
- The use of visuals to make explicit connections between the vocabulary and the content being learned.

Academic Vocabulary:	
Critical Terms: Benchmark fractions Common denominators Improper fraction Mixed numbers Visual fraction model Range	**Supplemental Terms:** Unit fractions Decompose Compose Equivalent Numerator Denominator Symbols Number line Line plot Distances (inches and feet) Intervals (of time) Elapsed time (seconds, minutes, hours, days, etc.) Liquid volume (fluid ounce, cup, pint, quart, gallon) Weight (ounce, pound, ton) Quarters Halves

Assessment

Summative Assessments

Generating Equivalent Expressions and Comparing Fractions
Decomposing Fractions/ Fraction Addition & Subtraction
Adding and Subtracting Fractions and Mixed Numbers Task
Measurement Conversion Task
Measurement Problem Solving
Interpreting Line Plots

Pre-Assessments	Formative Assessments	Self-Assessments
• Unit 2 Pre-Assessment 1 (3NF)	• Prove the Equivalence • Comparing Fractions • Composing and Decomposing Fractions • Multiplying Fractions • Multiplying Mixed Numbers • Using the PARCC Reference Guide • Measurement Conversion • Measuring Me	• Generating Equivalent Expressions and Comparing Fractions Self-Assessment

(January, February)

Desired Outcomes

Standard(s):

Understand decimal notation for fractions, and compare decimal fractions.

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

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

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

Transfer:

- Solving real-world problems involving decimal conversions in metric measurement (e.g. the length of a board being 0.74 meters).

Understandings: *Students will understand that …*

- Fractions with denominators of 10 can be expressed as an equivalent fraction with a denominator of 100.
- Fractions with denominators of 10 and 100 may be expressed using decimal notation.
- When comparing two decimals to hundredths, the comparisons are valid only if they refer to the same whole.

Essential Questions:

- How can visual models be used to help with understanding decimals?
- How can visual models be used to determine and compare equivalent fractions and decimals?
- How would you compare and order decimals through hundredths?

Highlighted Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them.**
* 2. **Reason abstractly and quantitatively.** Fourth graders should recognize that a number represents a specific quantity. They connect the quantity to written symbols (decimals) and create. They extend this understanding from whole numbers to their work with decimals. Students write simple expressions, record calculations with numbers, and represent decimals using place value concepts.
* 3. **Construct viable arguments and critique the reasoning of others.** Students restate and respond to each other about their mathematical thought processes.
4. **Model with mathematics.**
5. **Use appropriate tools strategically.** Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper or a number line to represent and compare decimals.
6. **Attend to precision.** Students demonstrate precision by using precise vocabulary in their oral and written explanations.
* 7. **Look for and make use of structure.** Students recognize and identify patterns in place value to understand the relationship between fractions and decimals (tenths and hundredths).
8. **Look for and express regularity in repeated reasoning.** Students in fourth grade should notice repetitive actions in computation with fractions to make generalizations. Students use models to explain calculations.

Prerequisite Skills/Concepts:

Students should already be able to…

- Represent fractions on a number line diagram.
- Recognize and generate simple equivalent fractions by using visual models.
- Compare fractions by reasoning about their size when they refer to the same whole.

Advanced Skills/Concepts:

Some students may be ready to…

- Add fractions with same denominators.

Knowledge: *Students will know…*

- A fraction with a denominator of 10 can also be expressed as an equivalent fraction with a denominator of 100.
- A number can be represented as both a fraction and a decimal.

Skills: *Students will be able to …*

- Represent a fraction with denominator 10 as an equivalent fraction with denominator 100. (4.NF.5)

• Decimal comparisons are only valid when the two decimals refer to the same whole.	• Add two fractions with denominators 10 and 100 using manipulatives, pictures, written symbols, and language to explain the process. (4.NF.5) • Write fractions with 10 and 100 in the denominator as decimals. (4.NF.6) • Compare two decimals to the hundredths using <, >, =. (4.NF.7) • Identify if decimal comparisons are valid or invalid and explain why. (4.NF.7) • Justify the conclusions using manipulatives, pictures, and/or language. (4.NF.7)

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- The use of visuals to make explicit connections between the vocabulary and the content being learned.

Academic Vocabulary:

Critical Terms:	**Supplemental Terms:**
• Decimals • Tenths • Hundredths • Decimal grids	

Assessment

Summative Assessments

Fractions and Decimals

Compare Decimals

Unit 3 Decimals

Pre-Assessments	**Formative Assessments**	**Self-Assessments**
• Unit 3: Decimals Pre- and Self-Assessment	• Equivalent Fractions: Tenths and Hundredths • Decimals • Decompose Fractions and Decimals • Can We Compare?	• Fractions and Decimals • Compare Decimals

Desired Outcomes

Standard(s):

Generate and analyze patterns.

4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

Generalize place value understanding for multi-digit whole numbers.

4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

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

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

Use the four operations with whole numbers to solve problems.

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

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

4.MD.1 Know relative sizes of measurement units within one system (metric) of units including km, m, cm; kg, g. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

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 measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

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.*

Transfer:

Students will apply concepts and procedures for adding, subtracting, multiplying and dividing multi-digit whole numbers to solve real-world and mathematical problems.

Ex. Based on census data from 2010, the population of Springfield, Illinois was 116,250. The population of the second largest city in Illinois, Aurora, was 197,899. How many more people were living in Aurora than Springfield in 2010?

Students will apply the area and perimeter formulas for rectangles when solving real-world problems.

Ex. Shana wants to plant a vegetable garden in her backyard. She has a rectangular area set aside that is 36 square feet. If the length of her garden is 9 feet, what would be the width of her garden?

Understandings: *Students will understand that …*

- Patterns are generated by following a specific rule.
- Rounding numbers can be used when estimating answers to real-world problems.
- The four operations are interconnected.
- The standard algorithm for addition and subtraction relies on adding or subtracting like base-ten units.
- Converting from larger to smaller units of measurement in the metric system is done by multiplying by powers of ten.
- Perimeter is a real life application of addition and subtraction.
- Area is a real life application of multiplication and division.

Essential Questions:

- What strategies can be used to find rules for patterns and what predictions can the pattern support?
- How are the four basic operations related to one another?
- How does understanding place value help you solve multi-digit addition and subtraction problems and how can rounding be used to estimate answers to problems?
- How are the units of measure within the metric system related?
- How do you find the area and perimeter of geometric figures and how can using the formulas for perimeter and area help you solve real-world problems?
- How do you know if a numerical value is reasonable for the situation?

Highlighted Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

* **1. Make sense of problems and persevere in solving them.** Students will solve word problems using all operations. Students will represent word problems using various modalities. Students will demonstrate their perseverance by selecting an effective modality to solve problems.

  2. Reason abstractly and quantitatively. Students determine what operations to use to solve word problems and think about the reasonableness of their solutions. Students use reasonable estimates based upon the value of the numbers.

  3. Construct viable arguments and critique the reasoning of others. Students demonstrate their ability to construct viable arguments when they talk and write about the steps they take to solve problems. Students restate and respond to each other about their mathematical thought processes.

* **4. Model with mathematics.** Students write equations when recording all steps used to solve multiplication and division problems. They use all modalities (picture, manipulatives, written symbols, real world situations, oral/written language) when representing a situation.

* **5. Use appropriate tools strategically.** Students choose and use the appropriate tools to solve problems. Tools could include: color tiles, base ten blocks, counters, math lines, geoboards, Unifix® cubes, websites, formulas, numerical equations, numerical expressions, diagrams, graph paper, shape diagrams, songs, whiteboards.

  6. Attend to precision. Students demonstrate precision in calculation by using their inverse operations to check their work and by using precise vocabulary in their oral and written explanations.

* **7. Look for and make use of structure.** Students recognize and identify patterns existing between addition and multiplication along with division and subtraction. Students use this knowledge when applying strategies to evaluate real-world problems such as area and perimeter. They also use problem solving structures to aid in solving real world problems.

* **8. Look for and express regularity in repeated reasoning.** Students identify and explain patterns within multiplication and division arrays (prime numbers, square numbers, and composite numbers, factors, multiples), determine and communicate whether identified patterns always work, determine and communicate when to apply specific patterns, describe the relationship between multiplication, addition, subtraction, and division, and justify that solutions make sense (ie, using mental computation and/or estimation).

Prerequisite Skills/Concepts: *Students should already be able to…* • Identify arithmetic patterns and explain using properties • Round numbers to the nearest 10 and 100 • Fluently add and subtract within 1000 • Fluently x and ÷ within 100 • Solve two-step word problems involving +, -, x and ÷ • Measure length, liquid volume, and mass using metric units • Multiply 1-digit whole number by multiples of 10 • Find the perimeter of geometric figures by using tiling and addition equations • Find the area of rectangles by using tiling and multiplication equations • Relate area to addition & multiplication (Arrays)	**Advanced Skills/Concepts:** *Some students may be ready to…* • Generate a pattern that follows a two-step rule. • Identify the rule and extend the pattern for a two-step function. • Convert measurements in the metric system and solve word problems that require the answer to be converted within the metric system.
Knowledge: *Students will know…* • Patterns are generated by following a specific rule. (4.OA.5) • Rounding can be used to estimate reasonable answers for word problems. (4.NBT.3) • How the four operations can be used to solve real-world and mathematical problems. (4.OA.3) • The relative size of measurement units within the metric system. (4.MD.1) • The formula for perimeter of geometric figures. (4.MD.3) • The formula for area of rectangles. (4.MD.3)	**Skills:** *Students will be able to …* • Generate a pattern that follows a rule. (4.OA.5) • Given a pattern, identify the rule and extend the pattern and also identify apparent features of a pattern that follows a given rule, which are not explicit in the rule itself. (4.OA.5) • Round multi-digit whole numbers to a given place. (4.NBT.3) • Explain the rounding process using visuals and/or language. (4.NBT.3) • Add and subtract multi-digit whole numbers up to 1,000,000. (4.NBT.4) • Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations. (4.OA.3) • Represent multi-step word problems using equations with a variable standing for the unknown quantity. (4.OA.3) • Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3) • Represent the larger unit of measure in terms of the smaller unit of measure within the metric system, using manipulatives, pictures, language and/or equations. (4.MD.1) • Record measurement equivalents in a two-column table. (4.MD.1) • Use pictures and equations to represent and solve addition, subtraction, multiplication and division word problems involving measurement, distance, liquid volumes and masses of objects.(4.MD.2)

	• Solve problems involving area and perimeter of rectangles using visuals and equations that represent the formulas for area and perimeter of rectangles. (4.MD.3)

WIDA Standard:

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

- A preview of critical vocabulary terms before instruction.
- The use of visuals to make explicit connections between the vocabulary and the content being learned.

Academic Vocabulary:

Critical Terms:	**Supplemental Terms:**
Shape patterns Rules Variable Formula	Number patterns Rounding Estimation Metric units of measurement Distance Liquid volume Mass Perimeter Area

Assessment

Summative Assessments

Roller Coaster Rounding Justification/Critique
Critiquing Addition and Subtraction
Adding & Subtracting Multi-Digit Numbers
Pattern Task
Perimeter Area Relationships
Measurement Analysis Task
Helping Out at the Vet Clinic
Dozens for My Cousins

Pre-Assessments	Formative Assessments	Self-Assessments
• Rounding Refresher • Adding or Subtracting Refresher • Area or Perimeter	• Roller Coaster Rounding • Rounding Games • Is it Reasonable? • Addition and Subtraction Centers • Gallery Walk • Growth Patterns • Numerical Patterns • Perimeter Area Relationships Tic Tac Toe • Measurement Conversion Scavenger Hunt • Task Cards • Interpreting Remainders	

Desired Outcomes

Standard(s):

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

4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

4.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.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Geometric measurement: understand concepts of angle and measure angles.

4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.
b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

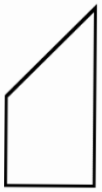
4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Transfer:

Students will apply concepts and procedures of classifying two-dimensional figures based on the presence of parallel or perpendicular lines.

Example:

How many acute, obtuse, or right angles are in this shape?



Students will apply concepts and procedures of decomposing angles into smaller parts.

Example:

A windshield wiper rotates 65 degrees and then pauses. It must rotate a total of 150 degrees to clear the windshield. What is the remaining amount of degrees the windshield wiper must rotate to complete its rotation to clear the windshield?

Understandings: *Students will understand that …*

- Shapes can be classified by properties of their lines and angles.
- Angles are measured in the context of a central angle of a circle
- Angles are composed of smaller angles.

Essential Questions:

- What are the types of angles and the relationships?
- How are angles applied in the context of a circle?
- How are parallel lines and perpendicular lines used in classifying two-dimensional shapes?
- How are protractors used to measure and aid in drawing angles and triangles?
- How can an addition or subtraction equation be used to solve a missing angle measure when the whole angle has been divided into two angles and only one measurement is given?

Highlighted Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

* **1. Make sense of problems and persevere in solving them.** Students use a drawing to conceptualize the given angle measures when solving for unknown angle measurements.

2. Reason abstractly and quantitatively. 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.

* **3. Construct viable arguments and critique the reasoning of others.** Students will justify their reasoning when classifying objects.

4. Model with mathematics. Students may use transparencies with lines to arrange two lines in different ways to determine that the 2 lines might intersect in one point or may never intersect. Further investigations may be initiated using geometry software. These types of explorations may lead to a discussion on angles.

* **5. Use appropriate tools strategically.** Students may use straight edges, rulers, and geometry software to create and analyze geometric objects.

6. Attend to precision. Students will measure angles to the nearest degree.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Prerequisite Skills/Concepts:

Students should already be able to…

- Classify shapes based on the number and length of sides and number of angles.
- Compose and decompose polygons to make other polygons.

Advanced Skills/Concepts:

Some students may be ready to…

- Apply their knowledge of geometric attributes to sort and classify two-dimensional and three-dimensional shapes.
- Measure angles greater than 180 degrees and relate them to the fractional part of a circle.

Knowledge: *Students will know…*	**Skills**: *Students will be able to …*
• Points, lines, line segments, rays, right angles, acute angles, obtuse angles, perpendicular lines, parallel lines can be identified within 2-dimensional figures. (4.G.1) • Angles are formed wherever two rays share a common endpoint. (4.MD.5) • An angle measure is a fraction of circular arc between the points where the two rays intersect the circle. (4.MD.5) • Benchmark angles and transfer their understanding that a 360^0 rotation about a point makes a complete circle to recognize and sketch angles that measure approximately 90^0 and 180^0. (4.MD.5) • An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. (4.MD.5) • Angle measure is additive (4.MD.7) • A line of symmetry for a two-dimensional figure is a line across the figure such that the figure can be folded along the line into matching parts. (4.G.3)	• Draw points, lines, line segments, rays, right angles, acute angles, obtuse angles, perpendicular lines, and parallel lines. (4.G.1) • Classify 2-dimensional figures based on the presence or absence of parallel or perpendicular lines and right, acute or obtuse angles. (4.G.2) • Identify and classify triangles. Label the categories of triangles (right triangles, scalene, isosceles) (4.G.2) • Recognize a line of symmetry for a two-dimensional figure as a fold-line, where the figure can be folded into matching parts. (4.G.3) • Determine whether a figure has one or more lines of symmetry and draw lines of symmetry. (4.G.3) • Identify the components of an angle and the number of degrees in a circle. (4.MD.5) • Use visuals and language to show the relationship between the components of an angle to a circle. (i.e. the center of the circle is the endpoint of the rays of the angle) (4.MD.5) • Measure angles in whole-number degrees using a protractor. (4.MD.6) • Sketch angles of a specified measure. (4.MD.6) • Use diagrams, manipulatives and equations to show that angle measure is additive. (4.MD.7) • Solve addition and subtraction problems to find unknown angles on a diagram of adjacent angles. (non-overlapping angles) (4.MD.7)

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Academic Vocabulary:	
Critical Terms: Points End points Lines Line segments Rays Angles (right, acute, obtuse) Central Adjacent angles Perpendicular lines Parallel lines Protractor Degrees Symmetry Right triangle Scalene triangle Isosceles triangle	**Supplemental Terms:** Plane (two-dimensional) figures Quadrilaterals Square Rhombus Rectangle Circle Triangle Additive

Assessment		
Summative Assessments Angles Assessment Geometry in Our World Attributes of 2-Dimensional Figures		
Pre-Assessments	**Formative Assessments**	**Self-Assessments**
• Categorizing Shapes	• Geometric Picture Dictionary • Draw & Label • Am I “Right”? • Two-Dimensional Sort • Lines of Symmetry • What’s My Turn • Measuring and Drawing Angles • Angle Scavenger Hunt	•