U46 Curriculum
U-46 Fourth Grade Mathematics

Module 1 – Place Value, Rounding, and Algorithms for Addition and Subtraction
Domain(s): Numbers and Operations in Base Ten
Trimester(s): 1

Transfer: *Students will apply…*

1. Students will apply concepts and procedures for adding, subtracting multi-digit whole numbers to solve real-world and mathematical problems.
2. Identify arithmetic patterns and explain using properties
3. Round numbers to the nearest 10 and 100
4. Fluently add and subtract within 1000

Understandings: *Students will understand that…*

1. Place value is based on groups of ten and the value of a number is determined by the place of its digits.
2. Whole numbers are read from left to right using the name of the period; commas are used to separate periods.
3. A number can be written using its name, standard, or expanded form.
4. Flexible methods of computation involve grouping numbers in strategic ways.

Essential Question(s):

1. 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?
2. How does the position of a digit in a number affect its value, and how can the value of digits be used to compare two numbers?
3. In what ways can numbers be composed and decomposed?

Knowledge: *Students will know…*

1. Patterns are generated by following a specific rule.
2. Rounding numbers can be used when estimating answers to real-world problems.
3. The four operations are interconnected.
4. The standard algorithm for addition and subtraction relies on adding or subtracting like base-ten units.

5. Rounding can be used to estimate reasonable answers for word problems. (4.NBT.3)

Skill: *Students will be able to do…*

1. Read and write whole numbers up to a million using standard, word, and expanded form. (4.NTB.2)
2. Compare two multi-digit (up to a million) numbers. (4.NBT.2)
3. Use manipulatives, pictures, and language to show the relationship between the numerals and their place value representations in multiple ways. (4.NBT.2)
4. Use visuals, symbols and/or language to explain their reasoning. (4.OA.4)
5. Round multi-digit whole numbers to a given place. (4.NBT.3)
6. Explain the rounding process using visuals and/or language. (4.NBT.3)
7. Add and subtract multi-digit whole numbers up to 1,000,000. (4.NBT.4)
8. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3)

Clusters/Standards:

Use the four operations with whole numbers to solve problems.[1]

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.

Generalize place value understanding for multi-digit whole numbers. (Grade 4 expectations are limited to whole numbers less than or equal to 1,000,000.)

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.

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

[1] Only addition and subtraction multi-step word problems are addressed in this module. The balance of this cluster is addressed in Modules 3 and 7.

Use place value understanding and properties of operations to perform multi-digit arithmetic.[2]

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

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Vocabulary:

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

Student Learning Experiences / Tasks:

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.*

[2] The balance of this cluster is addressed in Modules 3 and 7.

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.

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.*

Sprints / Number Bond Dash
Problem Sets
Exit Tickets
Homeworks

Instructional Resources/Assessment :

http://www.engageny.org/sites/default/files/resource/attachments/g4-m1-full-module.pdf (See exit slips within each lesson, and mid-module and end-module **assessment** at end of Module 1)

Module 2 – Unit Conversions
Domain(s): Measurement & Data
Trimester(s): 2

Transfer: ***Students will apply…***

Understandings: ***Students will understand that…***

1. When converting measurements within one system, the size, length, mass, volume of the object remains the same.
2. Converting from larger to smaller units of measurement in the metric system is done by multiplying by powers of ten.

Essential Question(s):

1. Why does the size, length, mass, volume of an object remain the same when converted to another unit of measurement?

Knowledge: ***Students will know…***

1. The relative size of measurement units within the metric system. (4.MD.1)

Skill: ***Students will be able to do…***

1. Identify relative sizes of measurement units within one system (customary) of units including lb., oz; hr, min, sec (4.MD.1)
2. 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)
3. Record customary measurement equivalents in a two column table. (4.MD.1)
4. 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)
5. Record measurement equivalents in a two-column table. (4.MD.1)
6. Measure objects to the nearest ½, ¼ or 1/8 of a unit. (4.MD.4)
7. Make a line plot to display a set of measurements to the nearest ½, ¼ or 1/8 of a unit. (4.MD.4)

Clusters/Standards:

Focus Grade Level Standards

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.[3]

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

4.MD.2[5] 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

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Vocabulary:

Critical Terms:

Centimeters	Grams	Pounds	Liters
Meters	Kilograms	Ounces	Milliliters
Kilometers			

Supplemental Terms:

Inches	Seconds	Days
Feet	Minutes	Weeks
	Hours	Months
		Years

[3] 4.MD.3 is addressed in Module 3.
[4] Pounds, ounces, and time are addressed in Module 7. This is a non-tested standard, but expressing metric measurements of length, weight, and volume from larger to smaller units strengthens the upcoming modules.
[5] Time and money will be addressed in Module 7. This is a non-tested standard, but the context of operating on distance, volume, and mass strengthens the upcoming modules.

Student Learning Experiences / Tasks:

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.

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.*

Problem Sets
Exit slips/quizzes
Homework

Instructional Resources/Assessment :

Engage NY: **http://www.engageny.org/sites/default/files/resource/attachments/math-g4-m2-full-module.pdf** (See exit slips within each lesson, and mid-module and end-module **assessment** at end of Module 2)

Module 3 – Multi-Digit Multiplication and Division
Domain(s): Operations & Algebraic Thinking; Number & Base Ten
Trimester(s): 1-2

Transfer: *Students will apply…*

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

Understandings: *Students will understand that…*

1. Flexible methods of computation involve grouping numbers in strategic ways.
2. The distributive property is connected to the area model and/or partial products method of multiplication.
3. Multiplication and division are inverse operations.
4. 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.
5. 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 situation.

Essential Question(s):

1. What is the difference between a prime and composite number?
2. How are multiplication and division related to each other?
3. What are different models for multiplication and division?
4. What are efficient methods for finding products and quotients, and how can place value properties aid computation?
5. How are dividends, divisors, quotients, and remainders related?
6. What real-life situations require the use of multiplication or division?
7. How can a remainder affect the answer in a division word problem?

Knowledge: ***Students will know…***

1. Multiplication equations can show comparisons (4.OA.1)
2. When to apply single equations or more than one equation using manipulatives, and/or diagrams to represent multiplicative comparison. (4.OA.1)
3. 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)
4. 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)
5. 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)

Skill: ***Students will be able to do…***

1. Translate comparative situations into drawings and equations with a symbol for the unknown and unknowns in all 3 locations. (4.OA.2)
2. Solve word problems involving multiplicative comparison using drawings and (multiplication or division) equations with a symbol for the unknown number and unknowns in all 3 locations. (4.OA.2)
3. Explain the difference between additive comparison and multiplicative comparison using visual and words. (4.OA.2)
4. 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)
5. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. (4.OA.4)
6. Determine whether a given whole number in the range 1-100 is prime or composite. (4.OA.4)
7. Use visuals, symbols and/or language to explain their reasoning. (4.OA.4)
8. Multiply up to 4-digit by 1-digit numbers and 2-digit by 2-digit numbers. (4.NBT.5)
9. 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)
10. 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)
11. Use place value manipulatives to represent division calculations. (4.NBT.6)
12. Use the relationship between multiplication and division to explain calculations. (4.NBT.6)
13. 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)
14. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3)

Clusters/Standards:

Focus Grade Level Standards

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.[72]

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.*

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 x 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. (See CCLS Glossary, Table 2.)

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.

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.[6]

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.

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Vocabulary:

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

Student Learning Experiences / Tasks:

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.

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.*

Sprints/Number Bond Dash
Problem Sets
Exit slips/quizzes
Homework

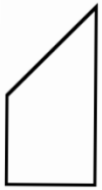
Instructional Resources/Assessment :

Engage NY: http://www.engageny.org/sites/default/files/resource/attachments/math-g4-m3-full_module.pdf (See exit slips within each lesson, and mid-module and end-module **assessment** at end of Module 3)

Module 4 – Angle Measures and Plane Figures
Domain(s): Geometry
Trimester(s): 3

Transfer: *Students will apply…*

1. 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?



2. Students will apply concepts and procedures of decomposing angles into smaller parts.
3. Classify shapes based on the number and length of sides and number of angles.
4. Compose and decompose polygons to make other polygons.

Understandings: *Students will understand that…*

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

Essential Question(s):

1. What are the types of angles and the relationships?
2. How are angles applied in the context of a circle?
3. How are parallel lines and perpendicular lines used in classifying two-dimensional shapes?
4. How are protractors used to measure and aid in drawing angles and triangles?
5. 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?

Knowledge: *Students will know…*

1. 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)

2. Angles are formed wherever two rays share a common endpoint. (4.MD.5)
3. An angle measure is a fraction of circular arc between the points where the two rays intersect the circle. (4.MD.5)
4. 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)
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)
6. Angle measure is additive (4.MD.7)

Skill: *Students will be able to do…*

1. Draw points, lines, line segments, rays, right angles, acute angles, obtuse angles, perpendicular lines, and parallel lines. (4.G.1)
2. Classify 2-dimensional figures based on the presence or absence of parallel or perpendicular lines and right, acute or obtuse angles. (4.G.2)
3. Identify and classify triangles. Label the categories of triangles (right triangles, scalene, isosceles) (4.G.2)
4. 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)
5. Determine whether a figure has one or more lines of symmetry and draw lines of symmetry. (4.G.3)
6. Identify the components of an angle and the number of degrees in a circle. (4.MD.5)
7. 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)
8. Measure angles in whole-number degrees using a protractor. (4.MD.6)
9. Sketch angles of a specified measure. (4.MD.6)
10. Use diagrams, manipulatives and equations to show that angle measure is additive. (4.MD.7)
11. Solve addition and subtraction problems to find unknown angles on a diagram of adjacent angles. (non-overlapping angles) (4.MD.7)

Clusters/Standards:

Geometric measurement: understand concepts of angle and measure angles.

4.MD.5 Recognize angles as geometric shapes that are formed whenever 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.

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.

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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

Student Learning Experiences / Tasks:

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.

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.*

Sprints / Number Bond Dash
Problem Sets
Exit Tickets
Homeworks

Instructional Resources/Assessment :

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Module 5 – Fraction Equivalence, Ordering, and Operations
Domain(s): Number & Operations - Fractions
Trimester(s): 2

Transfer: *Students will apply…*

2. Students will apply concepts and procedures to determine fraction equivalence and compare fractions.
3. 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.

Understandings: *Students will understand that…*

1. Fractions can be represented visually and in written form.
2. Comparisons are valid only when the two fractions refer to the same whole.
3. Fractions and Mixed Numbers are composed of unit fractions and can be decomposed as a sum of unit fractions.
4. Improper Fractions and Mixed Numbers represent the same value.
5. Addition and subtraction of fractions involves joining and separating parts referring to the same whole.
6. A product of a fraction times a whole number can be written as a multiple of a unit fraction.

Essential Question(s):

1. How are fractions used in problem-solving situations?
2. How are fractions composed, decomposed, compared and represented?
3. Why is it important to identify, label, and compare fractions as representations of equal parts of a whole or of a set?
4. How can multiplying a whole number by a fraction be displayed as repeated addition (as a multiple of a unit fraction)?

Knowledge: *Students will know…*

1. A fraction a/b is equivalent to a fraction (n x a)/(n x b). (4.NF.1)
2. Fractions with different denominators can be compared by using visual fraction models, benchmark fractions, finding common denominators, and finding common numerators. (4.NF.2)
3. 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)

Skill: ***Students will be able to do…***

1. Recognize and generate equivalent fractions (4.NF.1)
2. 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)
3. Identify if comparisons are valid or invalid and explain why. (4.NF.2)
4. Represent unit fractions as a fraction with a numerator of 1 with manipulatives, pictures, symbols, language, and real-life examples. (4.NF.3)
5. 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)
6. 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)
7. 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)
8. Represent multiplication of a fraction by a whole number as repeated addition using area or linear models. (4.NF.4)
9. 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).
10. 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)
11. Represent improper fractions with visual models to demonstrate their relationship to the two closest whole numbers. (4.NF.4)
12. Solve word problems involving multiplication of any fraction by a whole number by using visual models and/or equations. (4.NF.4)

Clusters/Standards:

Focus Grade Level Standards

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.*

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.
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.*

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?

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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.

Vocabulary:

Critical Terms:	**Supplemental Terms:**
Benchmark fractions Common denominators Improper fraction Mixed numbers Visual fraction model Range	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

Student Learning Experiences / Tasks:

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.

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.*

Problem Sets
Exit slips/quizzes
Homework

Instructional Resources/Assessment :

Engage NY: **http://www.engageny.org/sites/default/files/resource/attachments/math-g4-m5-full-module.pdf** (See exit slips within each lesson, and mid-module and end-module **assessment** at end of Module 5)

Module 6 – Decimal Fractions
Domain(s): Numbers and Operations. Fractions
Trimester(s): 2 and 3

Transfer: Students will apply…

1. *Solving real-world problems involving decimal conversions in metric measurement (e.g. the length of a board being 0.74 meters).*
2. *Use the four operations to solve real world problems involving money. (e.g. finding the cost of a group of items priced at $0.65, $4.89, $0.59 and $12.08).*
3. *Equivalent fractions and generated simple equivalent fractions by using visual fraction models.*

Understandings: Students will understand that…

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

Essential Question(s):

6. *How can visual models be used to help with understanding decimals?*
7. *How can visual models be used to determine and compare equivalent fractions and decimals?*
8. *How would you compare and order decimals through hundredths?*

Knowledge: Students will know…

1. *A fraction with a denominator of 10 can also be expressed as an equivalent fraction with a denominator of 100.*
2. *A number can be represented as both a fraction and a decimal.*
3. *Decimal comparisons are only valid when the two decimals refer to the same whole.*

Skill: Students will be able to do…

1. *Represent a fraction with denominator 10 as an equivalent fraction with denominator 100. (4.NF.5)*
2. *Add two fractions with denominators 10 and 100 using manipulatives, pictures, written symbols, and language to explain the process. (4.NF.5)*

3. *Write fractions with 10 and 100 in the denominator as decimals. (4.NF.6)*
4. *Compare two decimals to the hundredths using <, >, =. (4.NF.7)*
5. *Identify if decimal comparisons are valid or invalid and explain why. (4.NF.7)*
6. *Justify the conclusions using manipulatives, pictures and/or language. (4.NF.7)*

Clusters/Standards:

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*

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

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.

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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.

Vocabulary:

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

Student Learning Experiences / Tasks:

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.

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.*

Sprints / Number Bond Dash
Problem Sets
Exit Tickets
Homeworks

Instructional Resources/Assessment *:*

Engage NY: **http://www.engageny.org/sites/default/files/resource/attachments/math-g4-m6-full-module.pdf** (See exit slips within each lesson, and mid-module and end-module **assessment** at end of Module 6)

Module 7 – Exploring Multiplication
Domain(s): Operations & Algebraic Thinking; Number & Base Ten
Trimester(s): 3

Transfer: *Students will apply…*

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

Understandings: *Students will understand that…*

1. Flexible methods of computation involve grouping numbers in strategic ways.
2. The distributive property is connected to the area model and/or partial products method of multiplication.
3. Multiplication and division are inverse operations.
4. There are three different structures for multiplication problems: Area/Arrays, Equal Groups, and Comparison, and the unknown quantity in multiplication situations is represented in three ways: Unknown Product, Group Size Unknown, and Number of Groups Unknown.
5. Area is a real life application of multiplication and division.

Essential Question(s):

1. How are multiplication and division related to each other?
2. What are different models for multiplication?
3. What are efficient methods for finding products, and how can place value properties aid computation?
4. What real-life situations require the use of multiplication?
5. How would you find the area of geometric figures and how can using the formulas for area help you solve real-world problems?

Knowledge: *Students will know…*

1. Multiplication equations can show comparisons (4.OA.1)
2. When to apply single equations or more than one equation using manipulatives, and/or diagrams to represent multiplicative comparison. (4.OA.1)
3. 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)

4. 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)
5. Strategies for multiplying based on place value, the properties of operations, and/or the relationship between multiplication. (4.NBT.5 & 4.NBT.6)
6. The formula for perimeter of geometric figures. (4.MD.3)
7. The formula for area of rectangles. (4.MD.3)

Skill: *Students will be able to do…*

1. Translate comparative situations into drawings and equations with a symbol for the unknown and unknowns in all 3 locations. (4.OA.2)
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)
3. Explain the difference between additive comparison and multiplicative comparison using visual and words. (4.OA.2)
4. 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)
5. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. (4.OA.4)
6. Determine whether a given whole number in the range 1-100 is prime or composite. (4.OA.4)
7. Use visuals, symbols and/or language to explain their reasoning. (4.OA.4)
8. Multiply up to 4-digit by 1-digit numbers and 2-digit by 2-digit numbers. (4.NBT.5)
9. 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)
10. Use the relationship between multiplication and division to explain calculations. (4.NBT.6)
11. 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)
12. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3)
13. Solve problems involving area of rectangle using visuals and equations that represent the formulas for area and perimeter of rectangles. (4.MD.3)

Clusters/Standards:

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 x 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. (See Glossary, Table 2.)

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

4.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.

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.[78]

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

4.MD.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.

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Vocabulary:

Critical Terms:		**Supplemental Terms:**
Multiplicative comparison	Factor	Array
Standard Form	Multiple	Area Model
Written Form	Prime	Equation
Expanded Form	Composite	Product

Student Learning Experiences / Tasks:

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.*

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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.

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.*

Sprints/Number Bond Dash (Engage NY)
Problem Sets
Exit slips/quizzes
Homework

Instructional Resources/Assessment:

Engage NY: http://www.engageny.org/sites/default/files/resource/attachments/math-g4-m7-full-module.pdf (See exit slips within each lesson and module **assessment** at end of Module 7)