Course/Subject: Math	Grade: 4	Unit 1: Place Value	Suggested Timeline: 2 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	**Unit 1: Place Value** Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Place Value
Unit Summary	Our number system is a base-ten system. Students investigate the place value system with more intricacy each year. Fourth graders will recognize that the value of each digit relies on the place that the digit appears in a multi-digit number. Fourth grade students will investigate the relationship between digit values in different places. In turn, students will discover that a digit represents ten times greater than the same digit immediately in the place value to its right. Students also learn to read multi-digit numbers into the millions. When reading a number aloud, students will read three digits as they would any three digit number, but will need to add the name of the period when they get to a comma. Students will recognize that the same number can be represented in different forms: standard, expanded, and word. Students will apply their understanding of place value when comparing and ordering multi-digit numbers by using the greater than, less than, and equal to symbols. Students will apply their knowledge of place-value as they explore rounding large numbers to any place value. Adapted from *Math In Practice*

Unit Essential Questions:	Key Understandings:
1. How can you represent a multi-digit whole number using different forms? 2. What conclusions can you make about places within our base ten number system? 3. What effect does the location of the digit have on the value of the digit? 4. What happens to a digit when it is multiplied by 10? 5. Why is place value important to rounding multi-digit whole numbers? 6. How can understanding the value of a digit help you to compare and order whole numbers?	1. Numbers can be written in standard form, word form, and expanded form. 2. The value of a number is determined by the place of its digits (to the millions). 3. Each digit in a multi-digit whole number represents a value of ten times greater than the digit to its right. 4. Each digit in a multi digit whole number represents a value of ten times less than the digit to its left 5. Numbers can be rounded to any place value. 6. Whole numbers can be compared and ordered.

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	*Standard Description*
CC.2.1.4.B.1	Apply place value concepts to show an understanding of multi-digit whole numbers.
M04.A-T.1.1.1	Demonstrate an understanding that in a multi-digit whole number (through 1,000,000), a digit in one place represents ten times what it represents in the place to its right. Example: Recognize that in the number 770, the 7 in the hundreds place is ten times the 7 in the tens place. (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 $700 \div 70 = 10$ by applying concepts of place value and division.)
M04.A-T.1.1.2	Read and write whole numbers in expanded, standard, and word form through 1,000,000.
M04.A-T.1.1.3	Compare two multi-digit numbers through 1,000,000 based on meanings of the digits in each place, using >, =, and < symbols.
4.NBT.A.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.
M04.A-T.1.1.4	Round multi-digit whole numbers (through 1,000,000) to any place.
4.NBT.A.3	Use place value understanding to round multi-digit whole numbers to any place.

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.

Misconceptions:	Proper Conceptions:
● When writing numbers from verbal descriptions or moving from expanded form/word form to standard	● Students need to have a digit in each place even when the value of a place is zero.

form with a whole number, students simply place the digits in consecutive order without regard to their value.
- Students often assume that the first digit of a multi-digit number determines which number in a group of numbers has the greatest value. The assumption is made that 954 is greater than 1,002 because students are focusing on the first digit instead of the number as a whole.
- Students believe the relationship between the digits in consecutive place values corresponds to the value of each place. (The 3 in 130,450 is 1,000 times greater than the 3 in 63,256.)

- Students need to consider the value of each digit in a whole number before comparing them.

- The relationship between the digits in two consecutive place values is always ten times greater than the place value to its right.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
• Whole numbers can be written in various forms. • Place value understanding can be generalized for multi-digit whole numbers. • The place of the digits is used to understand the value of a whole number.	• Read multi-digit whole numbers to the millions • Write multi-digit whole numbers in standard form, word form and expanded form • Recognize and explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. • Compare multi-digit whole numbers to the millions • Order multi-digit whole numbers to the millions • Round multi-digit whole numbers any place	Standards of Mathematical Practice • SMP 1: Understand and Persevere • SMP 2: Reason Abstractly and Quantitatively • SMP 3: Justify and Critique • SMP 4: Model with Mathematics • SMP 5: Strategically use Tools • SMP 6: Attend to Precision • SMP 7: Utilize Structure • SMP 8: Utilize Patterns NYCSD Profile of A Graduate: • Creativity • Communication • Critical Thinking • Collaboration • Contributing • Courageous • Competent • Conscientious

Academic Vocabulary:

• Compare • Digits • Estimate • Expanded Form	• Period • Place Value • Round	• Standard Form • Value • Word Form

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
  - Use a data source to compare / round the number of years that an item takes to decompose in the environment
- Social Studies
  - Pick a city population and compare the different populations
- Written response

Additional Resources:
- *Math in Practice*, Module 3

Literature Connections:
- *How Much, How Many, How Far, How Heavy, How Long, How Tall is 1,000?* By Helen Nolan and Tracy Walker
- *Is A Blue Whale the Biggest Thing There Is?* By Robert . Wells
- *A Million Dots* by Andrew Clements
- *Sir Cumference and All the King's Tens* by Cindy Neuschwander
- *How Much is a Million?* By David Schwartz
- *Big Numbers* by Edward Packard
- *Zero, Is it Something? Is it Nothing?* By Claudia Zaslavsky

- Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann
- National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

			Math / Grade 4
			Unit 2

Course/Subject: Math	**Grade:** 4	**Unit 2:** Addition and Subtraction	**Suggested Timeline:** 2 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value **Unit 2: Addition and Subtraction of Whole Numbers** Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Addition and Subtraction
Unit Summary	In previous years students have used place value strategies to add and subtract multi-digit whole numbers with basic regrouping. In 4th grade students extend their understanding of place value concepts as they relate to addition and subtraction. Students also use estimation to determine the reasonableness of a sum or difference. This enables them to focus on addition and subtraction as a whole number rather than each place value's individual digit. Students should be able to explain why the standard algorithm works and use it efficiently to solve addition and subtraction single and multistep problems. Furthermore, students will determine the function in an input/output table with addition and subtraction rules and continue to apply algebraic reasoning to identify the missing symbols in addition and subtraction equations.

Unit Essential Questions: 1. How can place value concepts be applied to solve for the sum or difference of whole numbers?	**Key Understandings:** 1. Adding, subtracting, and estimating sums and differences to the millions including multi-step problems. 2. Generate and analyze patterns that follow a given rule. 3. Make connections between place value strategies and standard algorithms for addition and subtraction of multidigit numbers (MIP, p. 70)

Focus Standards Addressed in the Unit:

*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.1.4.B.2	Use place value understanding and properties of operations to perform multi-digit arithmetic.
M04.A-T.2.1.1	Add and subtract multi-digit whole numbers (limit sums and subtrahends up to and including 1,000,000).
4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
CC.2.2.4.A.1	Represent and solve problems involving the four operations.

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.
M04.B-O.1.1.4	Identify the missing symbol $(+, -, \times, \div, <, >, =,)$ that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to $+$, $-$, or $\times$ and to whole numbers or money).
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to $+$, $-$, or $\times$ and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
M04.A-T.2.1.4	Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits × 1 digit, excluding powers of 10).
M04.D-M.1.1.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
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.

Misconceptions:	Proper Conceptions:
• When subtracting and the digit in the place value of the subtrahend is larger, students find the difference between the two digits without regrouping.	• Students need to regroup from the place values to the left in order to subtract.

- When subtracting across zeros students do not apply place value understanding. - When adding two digits that equal a sum greater than 9, students write the total in the sum rather than regrouping. - Students add digits from left to right.	- Students need to regroup and distribute the appropriate amount in each place value. - Students need to regroup when the sum of two digits is greater than 9. - Students need to add digits from right to left.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
- Two or more addends can be combined to equal a sum. - Subtracting a subtrahend from a minuend equals the difference. - Sums and differences can be estimated. - Addition and subtraction problems can be solved by completing one step at a time. - Addition and subtraction equations can be solved by inputting the appropriate symbols. - Patterns can be formed by numbers using one rule. - Perimeter can be calculated by adding the lengths of the sides of a shape with straight sides.	- Add whole digit numbers up to the millions. - Subtract whole digit numbers up to the millions. - Estimate sums and differences up to hundred thousands using reasonableness. - Solve multi-step word problems using addition and subtraction. - Identify the missing symbol in addition and subtraction equations. - Generate and analyze patterns using one rule with addition or subtraction. - Determine the perimeter of a shape.	Standards of Mathematical Practice - SMP 1: Understand and Persevere - SMP 2: Reason Abstractly and Quantitatively - SMP 3: Justify and Critique - SMP 4: Model with Mathematics - SMP 5: Strategically use Tools - SMP 6: Attend to Precision - SMP 7: Utilize Structure - SMP 8: Utilize Patterns NYCSD Profile of A Graduate: - Creativity - Communication - Critical Thinking - Collaboration - Contributing - Courageous - Competent - Conscientious

Academic Vocabulary:

- Addend - Difference - Estimate	- Minuend - Regrouping - Standard algorithm	- Sum - Subtrahend

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
  - Adding and Subtracting different depths of the ocean
- Social Studies:
  - Pick a city population and add and subtract with different populations
  - Midwest Region add and subtract bushels of corn produced
  - Add and Subtract square footage of various regions in Pennsylvania
- Written response

Additional Resources:
- *Math in Practice*, Module 4

Literature Connections:
- *One Hundred Hungry Ants* By Elinor J. Pinczes
- *The King's Chessboard* by David Birch

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.* Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject: Math	Grade: 4	Unit 3: Multiplication of Whole Numbers	Suggested Timeline: 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing an understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers **Unit 3: Multiplication of Whole Numbers** Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Multiplication of Whole Numbers
Unit Summary	In previous years students explored multiplication as repeated addition. Now students will begin to think of multiplication as comparison when applicable. The types of multiplication problems students have explored before correlate with the three types of multiplicative comparison word problems. As students explore multiplicative comparison problems they will develop an understanding of multiplication and division as inverse operations. In addition to multiplication as comparison, students will explore factors and multiples. Their understanding of factors will aid them as they identify prime and composite numbers. In 3rd grade students explored the properties of multiplication and division and will now apply their understanding to work with larger numbers. They will multiply up to 1 digit by 4 digit numbers as well as 2 digit by 2 digit numbers using a variety of strategies that emphasize their understanding of place value. Furthermore, students will determine the function in an input/output table with multiplication rules and continue to apply algebraic reasoning to identify the missing symbols in addition, subtraction, and multiplication equations.

Unit Essential Questions:	Key Understandings:
1. How can you interpret word problems and solve multiplication as a comparison?	1. Interpret a multiplication equation as a comparison by representing verbal statements of multiplicative comparisons as multiplication equations.

2. Which strategies can you use to find factor pairs, multiples, prime, and composite numbers? 3. How can you multiply whole digit numbers?	2. Find all factor pairs for a whole number between 1 through 100. 3. Recognize that a whole number is a multiple of each of its factors. 4. Determine whether a whole number between 1-100 is prime or composite. 5. Multiply a whole number of up to four digits by a one-digit whole number and multiply 2 two-digit numbers. 6. Use strategies to solve multi-step word problems

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	*Standard Description*
CC.2.2.4.A.1	Represent and solve problems involving the four operations.
M04.B-O.1.1.1	Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations. Example 1: Interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Example 2: Know that the statement 24 is 3 times as many as 8 can be represented by the equation $24 = 3 \times 8$ or $24 = 8 \times 3$.
4.OA.A.1	Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ 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.
M04.B-O.1.1.2	Multiply or divide to solve word problems involving multiplicative comparison, distinguishing multiplicative comparison from additive comparison. Example: Know that 3×4 can be used to represent that Student A has 4 objects and Student B has 3 times as many objects not just 3 more objects.
4.OA.A.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.
CC.2.2.4.A.2	Develop and/or apply number theory concepts to find factors and multiples.
M04.B-O.2.1.1	Find all factor pairs for a whole number in the interval 1 through 100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the interval 1 through 100 is a multiple of a given one digit number. Determine whether a given whole number in the interval 1 through 100 is prime or composite.
4.OA.B.4	Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.
M04.A-T.2.1.2	Multiply a whole number of up to four digits by a one-digit whole number and multiply 2 two-digit numbers.
4.NBT.B.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.

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.

M04.B-O.1.1.4	Identify the missing symbol (+, −, ×, ÷, <, >, =,) that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to +, −, or × and to whole numbers or money.
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to +, −, or × and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
M04.A-T.2.1.4	Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits × 1 digit, excluding powers of 10).
M04.D-M.1.1.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
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.

Misconceptions:	Proper Conceptions:
● Students believe that all multiplicative comparison problems require them to multiply the two given numbers. ● In a multi-digit times multi-digit multiplication problem students "re-add" regrouped digits from the ones place when multiplying by the tens place. ● Students multiply the regrouped digits rather than adding them in. ● Students add the regrouped digits to the factor before multiplying.	● Some multiplicative comparison problems have a missing product while others have a missing factor. ● Regroups digits are only added into the product one time. ● Regrouped digits are always added, not multiplied. ● Regrouped digits are added after multiplying.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Multiplication can be interpreted as a comparison of two numbers. ● When two numbers are multiplied each number is known as a factor. ● Factor pairs are used to determine prime and composite numbers. ● A whole number is a multiple of each of its factors. ● Two numbers can be multiplied to find a product. ● Estimation can be used to determine the reasonableness of a product.	● Distinguish between additive and multiplicative comparisons. ● Interpret multiplication as comparison. ● Multiply to solve word problems that involve multiplicative comparisons. ● Determine the factor pairs for numbers 1-100. ● Determine if a whole number 1-100 is a multiple of a given 1 digit number. ● Determine if a whole number between 1-100 is prime or composite.	Standards of Mathematical Practice ● SMP 1: Understand and Persevere ● SMP 2: Reason Abstractly and Quantitatively ● SMP 3: Justify and Critique ● SMP 4: Model with Mathematics ● SMP 5: Strategically use Tools ● SMP 6: Attend to Precision ● SMP 7: Utilize Structure ● SMP 8: Utilize Patterns NYCSD Profile of A Graduate:

- The formula L x W can be used to determine the area of a rectangle. - Multiplication word problems can be solved by completing one step at a time. - Multiplication equations can be solved by inputting the appropriate symbols. - Patterns can be formed with numbers using one rule.	- Determine if a whole number between 1 and 100 is a multiple of a given 1 digit number. - Multiply a one digit whole number by a multi-digit number of up to four digits. - Multiply two two-digit numbers. - Check for reasonableness with estimation in a multiplication problem. - Use a formula to determine the area of a rectangle. - Use strategies to solve multi-step word problems involving variables as the unknown. - Identify a missing symbol in a number sentence. - Generate and analyze patterns using one rule with multiplication. - Determine the missing element in the function table. - Determine a rule for a function given a table.	- Creativity - Communication - Critical Thinking - Collaboration - Contributing - Courageous - Competent - Conscientious

Academic Vocabulary:

- Area model - Estimate - Prime	- Partial product - Product - Composite	- Rectangle model - Factor - Multiple

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
    - Pounds of trash generated per person per year
- Social Studies
    - Miner wages during the California Gold Rush (per day, week, month)
- Written response

Additional Resources:
- *Math in Practice*, Module 1, 2, and 5

Literature Connections:
- *The Best of Times* By Greg Tang
- *Perimeter, Area and Volume: A Monster Book of Dimensions* By: David A. Adler
- *The Doorbell Rang* By Pat Hutchins

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.* Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Course/Subject: Math	Grade: 4	Unit 4: Division of Whole Numbers	Suggested Timeline: 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing an understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers **Unit 4: Division of Whole Numbers** Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Division of Whole Numbers
Unit Summary	Students have explored basic division facts and related the operation of division to multiplication. Students will now extend their understanding of basic division to partition larger quantities. They will use exploration to find whole number quotients with a given multi-digit dividend and single digit divisor. Students will build an understanding of when and why to divide as well as interpret remainders within the context of a word problem. Furthermore, students will determine the function in an input/output table with division rules and continue to apply algebraic reasoning to identify the missing symbols equations with multiple operations.

Unit Essential Questions:	Key Understandings:
1. How can place value concepts be applied to solve for the quotient of whole numbers?	1. Dividing whole numbers up to four-digit dividends by one-digit divisors. 2. Remainders must be interpreted based on the context of the problem. 3. Generate and analyze patterns that follow a given rule.

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.1.4.B.2	Use place value understanding and properties of operations to perform multi-digit arithmetic.
M04.A-T.2.1.3	Divide up to four-digit dividends by one-digit divisors with answers written as whole-number quotients and remainders.
4.NBT.B.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.
M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.
M04.B-O.1.1.4	Identify the missing symbol (+, −, ×, ÷, <, >, =,) that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to +, −, or × and to whole numbers or money).
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to +, −, or × and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Important Standards Addressed in the Unit:

Misconceptions:	**Proper Conceptions:**
● Students misinterpret the value of the digits in the dividend. ● Students distribute the remainder among "groups" making them unequal. ● When dividing in the context of a word problem students forget to interpret the remainder in how it impacts the quotient.	● Each digit maintains its value based on its place in the number and that affects the value of the quotient. ● Any "part" of the dividend that is left over after making equal groups is the remainder. ● Depending on the context of the quotient, you either need to ignore the remainder or increase the quotient.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
- Whole numbers can be divided into equal groups. - Remainders can be interpreted based on the context of the problem. - Multi-step problems can be solved by completing one step at a time. - Equations can be solved by inputting the appropriate symbols. - Patterns can be formed by numbers using one rule.	- Divide multi-digit numbers by a whole one-digit divisor using models or place value strategies. - Interpret the remainder in a division problem. - Solve multi-step word problems using all four operations - Identify the missing symbol in equations with all four operations. - Generate and analyze patterns using one rule.	Standards of Mathematical Practice - SMP 1: Understand and Persevere - SMP 2: Reason Abstractly and Quantitatively - SMP 3: Justify and Critique - SMP 4: Model with Mathematics - SMP 5: Strategically use Tools - SMP 6: Attend to Precision - SMP 7: Utilize Structure - SMP 8: Utilize Patterns NYCSD Profile of A Graduate: - Creativity - Communication - Critical Thinking - Collaboration - Contributing - Courageous - Competent - Conscientious

Academic Vocabulary:

- Dividend - Divisor	- Partial Quotient - Quotient	Remainder

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
- Social Studies - State population divided by number of House of Representatives or Senators
- Written response

Additional Resources:
- *Math in Practice*, Module 6

Literature Connections:
- *A Remainder of One* by Elinor Pinczes

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject: Math	Grade: 4	Unit 5: Foundations of Fractions	Suggested Timeline: 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers **Unit 5: Foundations of Fractions** Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Foundations of Fractions
Unit Summary	The foundations of fractions unit is an extension of the basic understanding of fractions in third grade. Students should understand what fractions are, be able to represent fractions with notations and models, and use models and number lines to represent equivalent fractions. As students continue to develop a stronger level of understanding, they will now use models and computation to find equivalent fractions. Building this level of understanding with fractions will allow the students to reason about the quantity of two fractions to compare them.

Unit Essential Questions:	Key Understandings:
1. How can fraction concepts be used to build fractions, find equivalent fractions, and compare fractions?	1. Building fractions from unit fractions. 2. Recognizing two equivalent fractions. 3. Finding equivalent fractions with a denominator. 4. Comparing fractions with different numerators and denominators.

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.1.4.C.2	Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
4.NF.B.3	Understand a fraction a/b with a > 1 as a sum of fractions 1/b.
CC.2.1.4.C.1	Extend the understanding of fractions to show equivalence and ordering.
M04.A-F.1.1.1	Recognize and generate equivalent fractions.
4.NF.A.1	Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × 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.
M04.A-F.1.1.2	Compare two fractions with different numerators and different denominators (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100) using the symbols >, =, or < and justify the conclusions.
4.NF.A.2	Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Important Standards Addressed in the Unit:

Misconceptions:	Proper Conceptions:
● Students look at the numerator when comparing fractions because they believe that the numerator determines the value of the fraction. ● Students do not understand the fraction as a part of a whole.	● The numerator's relationship to the denominator determines the value of the fraction. ● A fraction is a part of a whole.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Unit fractions can be added to generate a new fraction. ● Equivalent fractions can be identified by comparing their values. ● Equivalent fractions can be created by multiplying by a fraction that is equal to one. ● Fractions can be compared using different strategies depending on the value of the numerator and denominator.	● Generate a fraction given unit fractions. ● Identify two fractions that are equivalent to each other. ● Generate equivalent fractions. ● Compare two fractions with different numerators and denominators.	Standards of Mathematical Practice ● SMP 1: Understand and Persevere ● SMP 2: Reason Abstractly and Quantitatively ● SMP 3: Justify and Critique ● SMP 4: Model with Mathematics ● SMP 5: Strategically use Tools ● SMP 6: Attend to Precision ● SMP 7: Utilize Structure ● SMP 8: Utilize Patterns NYCSD Profile of A Graduate: ● Creativity ● Communication ● Critical Thinking ● Collaboration

		● Contributing
		● Courageous
		● Competent
		● Conscientious

Academic Vocabulary:

● Benchmark	● Equivalent fractions	● Numerator
● Compare	● Fraction	● Order
● Denominator		

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
    - ○
- Social Studies
    - ○ Number of states per region out of total states in United States (fraction, simplest form, compare fractions)
- Written response

Additional Resources:
- *Math in Practice*, Module 7

Literature Connections:
- *Fractions in Disguise: A Math Adventure* By Edward Einhorn
- *Full House: An Invitation to Fractions* By Dayle Ann Dodds

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

		Math / Grade 4 Unit 6

Course/Subject: Math	**Grade:** 4	**Unit 6:** Add and Subtract Fractions	**Suggested Timeline:** 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions **Unit 6: Addition and Subtraction of Fractions** Unit 7: Multiplication of Fractions Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Addition and Subtraction of Fractions
Unit Summary	With a foundation of fractions, students now will apply their understanding to add or subtraction fractions. Students will reason with sums and differences using estimation and concrete models. Then, students will decompose, add and subtract fractions with like denominators using models and representations with computation. They will recognize the use of fractions in the context of a word problem and compute reasonable solutions to represent their understanding.

Unit Essential Questions:	**Key Understandings:**
1. How can fraction concepts be used to find the sum and difference of two fractions with a common denominator?	1. Add fractions with like denominators. 2. Subtract fractions with like denominators. 3. Decompose fractions, including mixed numbers 4. Add mixed numbers with like denominators. 5. Subtract mixed numbers with like denominators. 6. Solve word problems involving addition and subtraction of fractions.

Focus Standards Addressed in the Unit:

*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	*Standard Description*
CC.2.1.4.C.2	Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
M04.A-F.2.1.1	Add and subtract fractions with a common denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; answers do not need to be simplified; and no improper fractions as the final answer).
M04.A-F.2.1.2	Decompose a fraction or a mixed number into a sum of fractions with the same denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100), recording the decomposition by an equation. Justify decompositions (e.g., by using a visual fraction model). Example 1: 3/8 = 1/8 + 1/8 + 1/8 OR 3/8 = 1/8 + 2/8 Example 2: 2 1/12 = 1 + 1 + 1/12 = 12/12 + 12/12 + 1/12
4.NF.B.3.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 = ⅛ + ⅛ + ⅛ ; ⅜ = ⅛ + 2/8 ; 2 ⅛ = 1 + 1 + ⅛ = 8/8 + 8/8 + ⅛.
M04.A-F.2.1.3	Add and subtract mixed numbers with a common denominator (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100; no regrouping with subtraction; fractions do not need to be simplified; and no improper fractions as the final answers).
4.NF.B.3.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.
M04.A-F.2.1.4	Solve word problems involving addition and subtraction of fractions referring to the same whole or set and having like denominators (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100).
4.NF.B.3.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.

Important Standards Addressed in the Unit:

CC.2.4.4.A.4:	Represent and interpret data involving fractions using information provided in a line plot.
M04.D-M.2.1.1	Make a line plot to display a data set of measurements in fractions of a unit (e.g., intervals of 1/2, 1/4, or 1/8).
M04.D-M.2.1.2	Solve problems involving addition and subtraction of fractions by using information presented in line plots (line plots must be labeled with common denominators, such as 1/4, 2/4, 3/4).
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.
M04.D-M.1.1.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
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.

Misconceptions:	**Proper Conceptions:**
● Students add or subtract both the numerators and denominators.	● Only the numerators are added or subtracted with fractions.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**

• The sum or difference of two fractions is found by adding or subtracting the numerators when they have a common denominator.	• Add two fractions with common denominators.	Standards of Mathematical Practice
• Fractions can be decomposed into the sum of fractions in more than one way.	• Subtract two fractions with common denominators.	• SMP 1: Understand and Persevere
• Computation with fractions can be modeled.	• Decompose a fraction in different ways.	• SMP 2: Reason Abstractly and Quantitatively
• The sum or difference of two mixed numbers is found by adding or subtracting the numerators and adding or subtracting the whole numbers.	• Decompose a mixed number in different ways.	• SMP 3: Justify and Critique
	• Model and justify the decomposition of fractions.	• SMP 4: Model with Mathematics
	• Add two mixed numbers with common denominators.	• SMP 5: Strategically use Tools
	• Subtract two mixed numbers with common denominators.	• SMP 6: Attend to Precision
• Fraction word problems can be solved by completing one step at a time.	• Solve one-step word problems by adding or subtracting fractions.	• SMP 7: Utilize Structure
		• SMP 8: Utilize Patterns

Standards of Mathematical Practice
- SMP 1: Understand and Persevere
- SMP 2: Reason Abstractly and Quantitatively
- SMP 3: Justify and Critique
- SMP 4: Model with Mathematics
- SMP 5: Strategically use Tools
- SMP 6: Attend to Precision
- SMP 7: Utilize Structure
- SMP 8: Utilize Patterns

NYCSD Profile of A Graduate:
- Creativity
- Communication
- Critical Thinking
- Collaboration
- Contributing
- Courageous
- Competent
- Conscientious

Academic Vocabulary:

• Decompose	• Sum	• Like Denominators
• Denominator	• Difference	• Unit Fraction
	• Improper Fraction	• Mixed Number

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science
    - ○
- Social Studies
    - ○
- Written response

Additional Resources:
- *Math in Practice*, Module 8

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

| Course/Subject: Math | Grade: 4 | Unit 7: Multiply Fractions | Suggested Timeline: 2 weeks |

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions **Unit 7: Multiplication of Fractions** Unit 8: Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Multiplication of Fractions
Unit Summary	Students will begin to develop and understanding of non unit fractions as a product of a fraction and a whole number. This understanding will be an extension of previous units on multiplication. Students will solve for the product of a fraction by a whole number through both modeling and computation. Focusing on both computation and problem solving skills, students will represent an understanding of the concept and select effective strategies for problem solving.

Unit Essential Questions:
1. How can fraction concepts be used to find the product of a fraction and a whole number?

Key Understandings:
1. Multiply a whole number by a unit fraction.
2. Multiply a whole number by a non-unit fraction.
3. Recognize that a/b is a multiple of 1/b.
4. Solve word problems involving multiplication of a fraction and a whole number.

Focus Standards Addressed in the Unit:

*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.1.4.C.2	Build fractions from unit fractions by applying and extending previous umderstanding of operations on whole numbers.
M04.A-F.2.1.5	Multiply a whole number by a unit fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100 and final answers do not need to be simplified or written as a mixed number). Example: 5 × (1/4) = 5/4
4.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
4.NF.B.4.A	Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).
M04.A-F.2.1.6	Multiply a whole number by a non-unit fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100 and final answers do not need to be simplified or written as a mixed number). Example: 3 × (5/6) = 15/6
4.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number
4.NF.B.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 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.
M04.A-F.2.1.7	Solve word problems involving multiplication of a whole number by a fraction (denominators limited to 2, 3, 4, 5, 6, 8, 10, 12, and 100).
4.NF.B.4.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?

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.
M04.B-O.1.1.4	Identify the missing symbol (+, −, ×, ÷, <, >, =,) that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4:	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to +, −, or × and to whole numbers or money).
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to +, −, or × and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
M04.A-T.2.1.4	Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits × 1 digit, excluding powers of 10).

M04.D-M.1.1.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
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.

Misconceptions:	Proper Conceptions:
● Students multiply the whole number times both the numerator and the denominator.	● Only the numerator is multiplied by the whole number.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● The product of a fraction and a whole number is found by multiplying the whole number times the numerator of the fraction. ● Fraction a/b is a multiple of fraction 1/b. ● Fraction word problems can be solved by completing one step at a time.	● Multiply a fraction times a whole number. ● Write an equation to show that a/b is a multiple of 1/b. ● Solve one-step word problems by multiplying a fraction times a whole number.	Standards of Mathematical Practice ● SMP 1: Understand and Persevere ● SMP 2: Reason Abstractly and Quantitatively ● SMP 3: Justify and Critique ● SMP 4: Model with Mathematics ● SMP 5: Strategically use Tools ● SMP 6: Attend to Precision ● SMP 7: Utilize Structure ● SMP 8: Utilize Patterns NYCSD Profile of A Graduate: ● Creativity ● Communication ● Critical Thinking ● Collaboration ● Contributing ● Courageous ● Competent ● Conscientious

Academic Vocabulary:

● Estimate	● Factors ● Product	● Repeated Addition

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science: Use a data source to compare / round the number of years that an item takes to decompose in the environment
- Social Studies: Pick a city population and compare the different populations
- Written response

Additional Resources:
- *Math in Practice*, Module 9

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject:	Grade:	Unit 8:	Suggested Timeline:
Math	4	Decimals	4 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions **Unit 8: Decimals** Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Foundation of Decimals
Unit Summary	Students understand decimals by connecting to fractions, initially exploring fractions with denominators of 10 and 100 using models. Students will be able to use this understanding to compare decimal values.

Unit Essential Questions:	**Key Understandings:**
1. How are fractions with a denominator of 10 or 100 compared and combined? 2. How are fractions with a denominator of 10 or 100 written and read as a decimal?	1. Fractions with a denominator of 10 or 100 can be compared and combined. 2. Fractions with a denominator of 10 or 100 can be written as a decimal. 3. Decimal notation allows the comparison of decimals to the hundredths.

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.1.4.C.3	Connect decimal notation to fractions, and compare decimal fractions (base 10 denominator, e.g., 19/100)
M04.A-F.3.1.2	Use decimal notation for fractions with denominators 10 or 100. Example: Rewrite 0.62 as 62/100 and vice versa.
4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.
M04.A-F.3.1.3	Compare two decimals to hundredths using the symbols >, =, or <.
4.NF.C.7	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
CC.2.1.4.C.3	Connect decimal notation to fractions, and compare decimal fractions (base 10 denominator, e.g. 19/100)
M04.A-F.3.1.1	Add two fractions with respective denominators 10 and 100. Example: Express 3/10 as 30/100, and add 3/10 + 4/100 = 30/100 + 4/100 = 34/100.
4.NF.C.5	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.2 For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
(4.OA.A.3)	(Solve multi-step 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.)
M04.B-O.1.1.4	Identify the missing symbol (+, −, ×, ÷, <, >, =,) that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4:	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex. Determine the missing elements in a function table (limit to +, −, or × and to whole numbers or money).
M04.B-O.3.1.2	Determine the rule for a function given a table (limit to +, −, or × and to whole numbers).
M04.B-O.3.1.3	(Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.)
(4.OA.C.5)	
M04.A-T.2.1.4	Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits × 1 digit, excluding powers of 10).

Misconceptions:	**Proper Conceptions:**
- Students often mistake the difference between the decimal place value of tenths and hundredths. - Students comparing decimals often mistake .7 for .07 when comparing a tenth and a hundredth value.	Students foundational understanding of fractions, and their relationship to decimals, will help to recognize decimal values and comparison.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
- Fractions with a denominator of 10 and 100 can be written as equivalent fractions and compared. - Fractions with denominators of 10 and 100 can be written as decimals. - Students will read and write decimals to the tenths and hundredths. - Students will compare decimals to hundredths.	- Students will rewrite a fraction with a denominator of 10 as an equivalent fraction with a denominator of 100. - Students will add two fractions with denominators of 10 and 100. - Students will represent fractions with denominators of 10 and 100 as decimals. - Students will read and write decimals to hundredths. - Students will compare decimals to hundredths.	Standards of Mathematical Practice - SMP 1: Understand and Persevere - SMP 2: Reason Abstractly and Quantitatively - SMP 3: Justify and Critique - SMP 4: Model with Mathematics - SMP 5: Strategically use Tools - SMP 6: Attend to Precision - SMP 7: Utilize Structure - SMP 8: Utilize Patterns NYCSD Profile of A Graduate: - Creativity - Communication - Critical Thinking - Collaboration - Contributing - Courageous - Competent - Conscientious

Academic Vocabulary:

- Decimal - Decimal Point	Equivalent	- Hundredths - Tenths

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science: Use a data source to compare / round the number of years that an item takes to decompose in the environment
- Social Studies: Pick a city population and compare the different populations
- Written response

Additional Resources:
- *Math in Practice*, Module 10

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rogers, Amy Wildasin
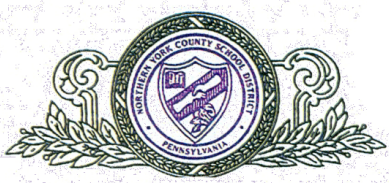
	Math / Grade 4
	Unit 9

Course/Subject: Math	**Grade:** 4	**Unit 9:** Angle Measures	**Suggested Timeline:** 2 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing an understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Convert Fractions and Decimals **Unit 9: Angle Measures** Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Angle Measures
Unit Summary	Fourth grade students are introduced to measuring angles. In previous years and lessons, students identified angles based off of the angle measure. Using the benchmark of 90 and 180 degrees, students will make reasonable estimates of various angles. Students will also use protractors to measure and create angles to a specific degree. They will learn that angle measures are additive and students will use the properties of two angles to determine additional angle measures.

Unit Essential Questions:	**Key Understandings:**
1. How can angles be measured and drawn using a protractor? 2. How can unknown adjacent angle measurements be found using concepts of angles?	1. Measure angles in whole number degrees using a protractor 2. Using a protractor, draw angles with a given measure 3. Solve to find unknown adjacent angle measures

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	*Standard Description*
CC.2.3.4.A.1	Draw lines and angles and identify these in two-dimensional figures.

M04.C-G.1.1.1	Draw points, lines, line segments, rays, angles (right, acute, and obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
CC.2.4.4.A.6	Measure angles and use properties of adjacent angles to solve problems.
4.MD.5	Recognize angles as geometric shapes that are formed wherever two rays sharing a common endpoint, and understand the concepts of angle measurement
4.MD.5a	An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles
4.MD.5b	An angle that turns through n one degree angles is said to have an angle measure of n degrees.
M04.D-M.3.1.1	Measure angles in whole-number degrees using a protractor. With the aid of a protractor, sketch angles of specified measure.
4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
M04.D-M.3.1.2	Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems. (Angles must be adjacent and non-overlapping.)
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.

Important Standards Addressed in the Unit:

Misconceptions:	Proper Conceptions:
- When aligned correctly, whichever number a ray points to on a protractor is the angle measure. - The vertex does not have to be aligned with the center point on the protractor.	- The number that represents the measurement of the angle must be less than 90 degrees if it is an acute angle and greater than 90 degrees if it is an obtuse angle. - In order to get an accurate measurement the vertex must be aligned with the center point.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
- Angles can be measured with a protractor. - Angles can be drawn with a protractor. - Unknown adjacent angles can be found using properties of adjacent angles.	- Measure angles using a protractor. - Draw angles using a protractor. - Use properties of adjacent angles to solve problems.	Standards of Mathematical Practice - SMP 1: Understand and Persevere - SMP 2: Reason Abstractly and Quantitatively - SMP 3: Justify and Critique - SMP 4: Model with Mathematics - SMP 5: Strategically use Tools - SMP 6: Attend to Precision - SMP 7: Utilize Structure - SMP 8: Utilize Patterns NYCSD Profile of A Graduate: - Creativity - Communication - Critical Thinking

		● Collaboration
		● Contributing
		● Courageous
		● Competent
		● Conscientious
		● Competent
		● Conscientious

Academic Vocabulary:

● Acute angle	● Endpoint	● Obtuse angle
● Acute Triangle	● Equilateral Triangle	● Obtuse triangle
● Adjacent Angles	● Intersecting Lines	● Parallel lines
● Degree	● Isosceles Triangle	● Parallelogram
● Quadrilateral	● Line	● Perpendicular lines
● Ray	● Line of symmetry	● Point
● Rectangle	● Line segment	● Protractor
● Rhombus	● Right Angle	● Square
● Scalene Triangle	● Right Triangle	● Symmetry
	● Vertex	● Trapezoid

Evidence: Assessments and Performance Task(s)

● Performance Tasks
● Formative Assessment
● Summative Assessment

Interdisciplinary Connections:
● Science: Use a data source to compare / round the number of years that an item takes to decompose in the environment
● Social Studies: Pick a city population and compare the different populations
● Written response

Additional Resources:
● *Math in Practice*, Module 14

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject: Math	Grade: 4	Unit 10: Classify 2D Shapes	Suggested Timeline: 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing an understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Convert Fractions and Decimals Unit 9: Angle Measures **Unit 10: Classification of 2 Dimensional Shapes** Unit 11: Measurement Conversions Unit 12: Data and Graphing

Unit Title	Classifying 2D Shapes
Unit Summary	Students have been exploring with shapes for years. Students will analyze and describe shapes based off of various lines and angles (parallel, perpendicular, intersecting, right, acute, obtuse, and straight). Then they will classify shapes by properties. There is a great emphasis on the specific properties of triangles and quadrilaterals. In this unit, students will also identify lines of symmetry within shapes. They will explore the meaning of symmetry, draw lines of symmetry, and determine whether or not a shape has one or more lines of symmetry.

Unit Essential Questions: 1. How can shapes be classified by attributes?	**Key Understandings:** 1. Identify properties of shapes using the vocabulary; (parallel, perpendicular, intersecting, right, acute, obtuse, and straight). 2. Classify two-dimensional figures by attributes. 3. Recognize lines of symmetry 4. Draw lines of symmetry

Focus Standards Addressed in the Unit:

*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.3.4.A.2:	Classify two-dimensional figures by properties of their lines and angles.
M.04.C-G.1.1.1	Draw points, lines, line segments, rays, angles (right, acute, and obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
M.04.C-G.1.1.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
4.G.2	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.
CC.2.3.4.A.3	Recognize symmetric shapes and draw lines of symmetry.
M04.C-G.1.1.3	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 mirroring parts. Identify line-symmetric figures and draw lines of symmetry (up to two lines of symmetry).
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.

Important Standards Addressed in the Unit:

CC.2.2.4.A.4:	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to +, –, or × and to whole numbers or money).
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to +, –, or × and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

Misconceptions:	Proper Conceptions:
- Triangles can only be classified in one way - The line of symmetry cuts the shape in half	- Triangles can be named by both side length and angle measures - A line of symmetry is when the shape can be folded to make two congruent shapes that fit exactly on top of each other.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
• Lines, rays, and angles are used to identify two- dimensional figures.	• Identify and name points, line segments, rays, lines, and angles	Standards of Mathematical Practice • SMP 1: Understand and Persevere

• Shapes are classified based on the presence or absence of properties • A line of symmetry is the exact reflection or mirror image of a shape. • Shapes can have none, one, or more than one line of symmetry.	• Identify perpendicular lines, parallel lines, and intersecting lines within shapes. • Classify triangles and quadrilaterals • Identify and draw a line of symmetry in a figure	• SMP 2: Reason Abstractly and Quantitatively • SMP 3: Justify and Critique • SMP 4: Model with Mathematics • SMP 5: Strategically use Tools • SMP 6: Attend to Precision • SMP 7: Utilize Structure • SMP 8: Utilize Patterns NYCSD Profile of A Graduate: • Creativity • Communication • Critical Thinking • Collaboration • Contributing • Courageous • Competent • Conscientious

Academic Vocabulary:

• Acute angle • Acute Triangle • Adjacent Angles • Degree • Quadrilateral • Ray • Rectangle • Rhombus • Scalene Triangle	• Endpoint • Equilateral Triangle • Intersecting Lines • Isosceles Triangle • Line • Line of symmetry • Line segment • Right Angle • Right Triangle • Vertex	• Obtuse angle • Obtuse triangle • Parallel lines • Parallelogram • Perpendicular lines • Point • Protractor • Square • Symmetry • Trapezoid

Evidence: Assessments and Performance Task(s)

• Performance Tasks
• Formative Assessment
• Summative Assessment

Interdisciplinary Connections:
• Science: Use a data source to compare / round the number of years that an item takes to decompose in the environment
• Social Studies: Pick a city population and compare the different populations
• Written response

Additional Resources:
• *Math in Practice*, Module 14

Literature Connections
Seeing Symmetry (Loreen Leedy)

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.* Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject: Math	Grade: 4	Unit 11: Measurement Conversions	Suggested Timeline: 3 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Convert Fractions and Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes **Unit 11: Measurement Conversions** Unit 12: Data and Graphing

Unit Title	Measurement Conversions
Unit Summary	Students will identify measurements within both the United States customary system and the metric system. These measurements include the measurement of length, capacity, mass, time and money. Students will find equivalent units of measure, solve problems involving units of measurement, and make conversions from larger to smaller units.

Unit Essential Questions:
1. How can measurement concepts be used to convert measurements, solve word problems, calculate elapsed time, and solve area and perimeter problems?

Key Understandings:
1. Know relative sizes of measurement in customary and metric units.
2. Convert measurements from a larger unit to a smaller unit.
3. Solve word problems involving measurement.
4. Calculate elapsed time (start unknown, end known, and elapsed time unknown).
5. Solve problems using area and perimeter.

Focus Standards Addressed in the Unit:

*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.4.4.A.1	Solve problems involving measurement and estimation of temperature, liquid volume, mass or length.
M04.D-M.1.1.1	Know relative sizes of measurement units within one system of units including standard units (in., ft, yd, mi; oz., lb; and c, pt, qt, gal), metric units (cm, m, km; g, kg; and mL, L), and time (sec, min, hr, day, wk, mo, and yr). Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. A table of equivalences will be provided. Example 1: Know that 1 kg is 1,000 times as heavy as 1 g. Example 2: Express the length of a 4-foot snake as 48 in
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), …
M04.D-M.1.1.2	Use the four operations to solve word problems involving distances, intervals of time (such as elapsed time), liquid volumes, masses of objects; 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.
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.
M04.D-M.1.1.4	Identify time (analog or digital) as the amount of minutes before or after the hour. Example 1: 2:50 is the same as 10 minutes before 3:00. Example 2: Quarter past six is the same as 6:15
M04.D-M.1.1.3	Apply the area and perimeter formulas for rectangles in real-world and mathematical problems (may include finding a missing side length). Whole numbers only. The formulas will be provided.
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.

Important Standards Addressed in the Unit:

M04.B-O.1.1.3	Solve multi-step word problems posed with whole numbers using the four operations. Answers will be either whole numbers or have remainders that must be interpreted yielding a final answer that is a whole number. Represent these problems using equations with a symbol or letter standing for the unknown quantity.
4.OA.A.3	Solve multi-step 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.
M04.B-O.1.1.4	Identify the missing symbol (+, −, ×, ÷, <, >, =,) that makes a number sentence true (single-digit divisor only).
CC.2.2.4.A.4	Generate and analyze patterns using one rule.
M04.B-O.3.1.1	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. Example 1: Given the rule "add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms alternate between odd and even numbers. Example 2: Given the rule "increase the number of sides by 1" and starting with a triangle, observe that the tops of the shapes alternate between a side and a vertex.
M04.B-O.3.1.2	Determine the missing elements in a function table (limit to +, −, or × and to whole numbers or money).
M04.B-O.3.1.3	Determine the rule for a function given a table (limit to +, −, or × and to whole numbers).
4.OA.C.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate

	between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
M04.A-T.2.1.4	Estimate the answer to addition, subtraction, and multiplication problems using whole numbers through six digits (for multiplication, no more than 2 digits × 1 digit, excluding powers of 10).

Misconceptions:	Proper Conceptions:
• Shapes with a certain area can only have one perimeter and vice versa. • Quantities get smaller when converting from a large measurement to a smaller measurement. • When the start time is unknown in an elapsed time problem and the minutes go back past the nearest hour, the hour doesn't change (example: end time is 5:10 and it lasted 3 hours 45 minutes; students might go back 3 hours to 2:10 and then back 45 minutes to 2:35, without pushing the hour back to 1:35.)	• Depending on how the shape of the area is changed, the perimeter can change as well, and vice versa. • Quantities increase when converting from a large measurement to a smaller measurement. • Whenever the times goes back past the hour, an hour must be subtracted.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
• Objects/distances can be measured with different units in customary and metric units. • Measurements can be converted from larger units to smaller units. • Word problems with measurement can be solved one step at a time. • Elapsed time can be determined given a start time and end time. • A start time or end time can be determined given the elapsed time and either the start or end time. • Problems with area and perimeter can be solved using the formula for each one.	• Determine appropriate units to measure objects/distances. • Convert measurements from larger units to smaller units. • Solve word problems involving measurement. • Solve elapsed time problems. • Solve area and perimeter problems.	Standards of Mathematical Practice • SMP 1: Understand and Persevere • SMP 2: Reason Abstractly and Quantitatively • SMP 3: Justify and Critique • SMP 4: Model with Mathematics • SMP 5: Strategically use Tools • SMP 6: Attend to Precision • SMP 7: Utilize Structure • SMP 8: Utilize Patterns NYCSD Profile of A Graduate: • Creativity • Communication • Critical Thinking • Collaboration • Contributing • Courageous • Competent • Conscientious

Academic Vocabulary:

• Capacity • Centimeter • Elapsed Time • Foot • Gallon	• Gram • Inch • Kilogram • Liter • Mass • Second • Week • Yard • Year	• Meter • Milligram • Milliliter • Millimeter • Minute • Month • Ounce • Pound • Quart

Evidence: Assessments and Performance Task(s)

- Performance Tasks
- Formative Assessment
- Summative Assessment

Interdisciplinary Connections:
- Science: Use a data source to compare / round the number of years that an item takes to decompose in the environment
- Social Studies: Pick a city population and compare the different populations
- Written response

Additional Resources:
- *Math in Practice*, Module 11

Literature Connections:
- *Perimeter, Area and Volume: A Monster Book of Dimensions* By: David A. Adler

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

Created By:
Marianne Kirkhoff, Mariah Rodgers, Amy Wildasin

Course/Subject: Math	Grade: 4	Unit 12: Data and Graphing	Suggested Timeline: 2 weeks

Grade Level Summary	In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.
Grade Level Units	Unit 1: Place Value Unit 2: Addition and Subtraction of Whole Numbers Unit 3: Multiplication of Whole Numbers Unit 4: Division of Whole Numbers Unit 5: Foundations of Fractions Unit 6: Addition and Subtraction of Fractions Unit 7: Multiplication of Fractions Unit 8: Convert Fractions and Decimals Unit 9: Angle Measures Unit 10: Classification of 2 Dimensional Shapes Unit 11: Measurement Conversions **Unit 12: Data and Graphing**

Unit Title	Data and Graphing
Unit Summary	Students will solve problems related to data from different graphs. Students will represent and interpret data from line plots, scaled bar graphs, and scaled picture graphs.

Unit Essential Questions:
1. How do you create and interpret line plots using fractions to ⅛ as the unit.
2. How do you create and interpret scaled bar graphs and scaled picture graphs?
3. How do you solve problems using data from graphs?

Key Understandings:
1. Line plots can be created and interpreted in fractional units.
2. Line plot data can be used to solve addition and subtraction problems.
3. Scaled bar graphs can be created, interpreted, and used for problem solving.
4. Scaled picture graphs can be created, interpreted, and used for problem solving.

Focus Standards Addressed in the Unit:
*Standards with prefix "CC" and "M04" denote PA Core Standards and eligible content, and standards beginning with "4" denote Common Core Standards.

Standard Number	Standard Description
CC.2.4.4.A.2	Translate information from one type of data display to another.
M04.D-M.2.1.1	Make a line plot to display a data set of measurements in fractions of a unit (e.g., intervals of ½, ¼, or ⅛).
4.MD.B.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.*
M04.D-M.2.1.2	Solve problems involving addition and subtraction of fractions by using information presented in line plots (line plots must be labeled with common denominators, such as ¼, 2/4, 3/4).
M04.D-M.2.1.3	Translate information from one type of display to another (table, chart, bar graph, or pictograph).
CC.2.4.4.A.4	Represent and interpret data involving fractions using information provided in a line plot.
M04.D-M.2.1.1	Make a line plot to display a data set of measurements in fractions of a unit (e.g., intervals of 1/2, 1/4, or 1/8).
M04.D-M.2.1.2	Solve problems involving addition and subtraction of fractions by using information presented in line plots (line plots must be labeled with common denominators, such as 1/4, 2/4, 3/4).
M04.D-M.2.1.3	Translate information from one type of display to another (table, chart, bar graph, or pictograph).

Important Standards Addressed in the Unit:

Misconceptions:	Proper Conceptions:
● Students often place numbers with random spacing or intervals on a number line ● Data can be misrepresented when students draw bar graphs and picture graphs with different sized bars or pictures that skew the information.	● Students will precisely determine interval and space the numbers equally. ● Students will precisely draw graphs to appropriate size and scale.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Line plots can be written using fraction intervals. ● Data from line plots represents real world situations. ● Scaled bar graphs represent real world situations. ● Scaled picture graphs represent real world situations. ● Problems can be solved using data from graphs.	● Create line plots including fractions with intervals of ¼, ½, or ⅛ ● Interpret line plots ● Solve word problems involving line plots ● Create and interpret scaled bar graphs ● Create and interpret scaled picture graphs ● Solve problems using data from graphs	Standards of Mathematical Practice ● SMP 1: Understand and Persevere ● SMP 2: Reason Abstractly and Quantitatively ● SMP 3: Justify and Critique ● SMP 4: Model with Mathematics ● SMP 5: Strategically use Tools ● SMP 6: Attend to Precision ● SMP 7: Utilize Structure ● SMP 8: Utilize Patterns NYCSD Profile of A Graduate: ● Creativity ● Communication ● Critical Thinking ● Collaboration ● Contributing ● Courageous

| | | ● Competent |
| | | ● Conscientious |

Academic Vocabulary:

● Axis	● Horizontal	● Line plot
● Bar graph	● Intervals	● Picture graph
● Cluster	● Key	● Scale
● Data	● Label	● Vertical
● Endpoint		

Evidence: Assessments and Performance Task(s)

● Performance Tasks
● Formative Assessment
● Summative Assessment

Interdisciplinary Connections:
● Science: Use a data source to create and interpret graphs
● Social Studies: Use a data source to create and interpret graphs
● Written response

Additional Resources:
● *Math in Practice*, Module 13

Sammons, K., O'Connell, S., SanGiovanni, J. (2016). *Math in practice: Teaching 4th grade math.* Portsmouth, NH. Heinemann

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards Initiative: Mathematics Standards.*Washington, D.C.: National Governors Association Center For Best Practices, Council of Chief State School Officers.

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