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Course Description and Rationale

The Ewing Public Schools’ Math Vision

*The Ewing Public Schools will deliver an instructional program in mathematics where students are actively engaged in the discovery of math concepts and are applying these concepts in ways that they find meaningful and relevant.*

*Ewing students will be mathematical thinkers who can reason, communicate and solve problems.*

*Ultimately, Ewing students will master and will be able to utilize these math concepts and skills throughout their lives.*

In this fourth grade course in mathematics, students 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.

While students will utilize a constructivist approach to investigate relationships in math, this approach will be balanced with a level of practice needed to attain skill mastery. Throughout the course, students will be actively engaged in problem solving through reasoning. Students will be expected to communicate their reasoning and problem solving on a daily basis through written and verbal formats.

In the end, the goal of this course is to develop young mathematicians with the habits of mind enabling them to meet the vision shared above, enabling their future success in mathematics.
Unit 1: Concepts and Properties of Multiplication

Why Is This Unit Important?

This unit focuses on the operation of multiplication. It helps develop ideas about the meaning of operations and the development of computational fluency. It will help students gain familiarity with factors and multiples, as well as identify properties of prime and composite numbers. Students will also work to develop number sense through the use of number patterns. The big ideas in this unit are:

- Multiplication is the process of repeated grouping
- Multiplication is a way of comparing and analyzing ‘groups of groups’
- Numbers have properties (such as prime and composite)
- Numbers can be arranged to uncover patterns which can help us to understand them

Enduring Understandings:

1. Understand ways to interpret a multiplication equation
2. Understand that multiplication situations can be represented with multiplication equations, pictures and arrays
3. Understand ways to distinguish between multiplication and addition situations
4. Understand ways to recognize factors and multiples
5. Understand ways to identify properties of prime and composite numbers
6. Understand ways to generate and analyze patterns with numbers
7. Understand how multiplication can be used to solve story problems

Essential Questions:

1. What is multiplication?
2. How does an array represent multiplication?
3. In what ways are multiplication and addition connected?
4. What is the difference between factors and multiples?
5. What does it mean to be prime? What does it mean to be composite?
6. How can numbers make patterns? What do these patterns tell us?
7. How can we use multiplication strategies to solve story problems?

Acquired Knowledge:

1. Multiplication can be 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 $5$).
2. The difference between multiplication situations and addition situations when solving problems.
3. An array represents multiplication.
4. A whole number is a multiple of each of its factors.
5. A whole number is a multiple of a one-digit number.
6. Prime numbers only have two factors (1 and itself).
7. Composite numbers have more than two factors.
8. Identify all factor pairs of a number.
9. Patterns in numbers uncover ‘truths’ about the structure and properties of numbers and the number system.

**Acquired Skills:**

1. Represent multiplication situations with multiplication equations, pictures and arrays.
2. Multiply to solve word problems, using drawings and equations with a symbol for the unknown number to represent the problem.
3. Find all factor pairs for a whole number in the range 1-100.
4. List multiples of a whole number in the range 1-100.
5. Identify numbers as prime or composite.
6. Generate and/or continue a number pattern.
7. Identify the ‘rule’ of number patterns (e.g., add 3).
8. Identify features of a pattern that were not explicit in the rule itself (e.g., when adding 3, the resulting pattern alternates between odd and even numbers).

**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 1
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4

**Differentiation:**

**Enrichments**

- Find arrays for larger numbers - What 2-digit number has the largest number of arrays?
- Multiple Turn Over – use all cards
- How can you know that you have all the factors?
- Why are factors of 16 also factors of 48? Does this work for 96?

**Supplements**

- Investigation 1 Quiz
- Represent Multiplication Arrays Intervention
- Assessment: Multiplication Combinations
- Factors and Multiples of 100
- Visualize factors of 300 using connecting cubes
Assessed Benchmarks:

- Find multiplication combinations for products of 100
- Use strategies to determine products on array cards
- Accurate model drawing for a given array
- Write story problems for given arrays
- Use known combinations to determine unknown combinations
- Correct usage of vocabulary – factor and multiple
- Determine if one number is a factor of another
- Use reasoning to determine related factors and why some numbers cannot be factors of another
- Extended Constructed Response: *Multiplication Patterns*

List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

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Suggested Learning Experiences and Instructional Activities:

- Things That Come in Arrays
- Making Arrays
- Using Arrays to Multiply
- Multiple Turn Over
- Factors of 100
- Factors of the Multiples of 100
- Factors of Related Numbers
- Number Patterns
- Review Activity—Number Puzzles
- Unit Assessment

Technology:

- Relationship of Addition to Multiplication (explanation and practice): [http://www.aaamath.com/g4_39_x2.htm](http://www.aaamath.com/g4_39_x2.htm)
- Identifying Factors of a Number (game): [http://www.helpingwithmath.com/resources/games/target_factors01/not_factor.html](http://www.helpingwithmath.com/resources/games/target_factors01/not_factor.html)
• Prime and Composite Numbers (explanation and practice): http://www.aaastudy.com/fra63ax2.htm
• Prime and Composite Numbers (explanation and examples): http://www.mathsisfun.com/prime-composite-number.html
• Story Problems (different levels of practice): http://www.dadsworksheets.com/v1/Worksheets/Word%20Problems.html

Ten-Minute Math:

• Multiplication fact practice
• Array of the Day
• Input/Output Boxes or Number Patterns
Unit 2: Number and Operations in Base Ten

Why Is This Unit Important?

This unit focuses on place value, rounding, addition and subtraction. It will help students reinforce computational fluency, the structure of place value and the base-ten number system. One goal of this unit is to help students transition from familiar addition and subtraction strategies to the standard U.S. traditional algorithms by applying the concepts of place value. The big ideas in this unit are:

• The base-ten structure of the number system
• The U.S. traditional algorithm for addition and subtraction, though not explicitly seen, are built upon operations involving place value, decomposing and recomposing of numbers

Enduring Understandings:

1. Understand the place value system and structure of numbers
2. Understand how base-ten is used to read, write, round and compare numbers
3. Understand how place value, decomposing and recomposing are used in the standard U.S. traditional algorithm for addition and subtraction
4. Understand how place value knowledge can be used to solve problems with addition and subtraction

Essential Questions:

1. How does the number system work? What is the connection between value of a number and its place?
2. What is the difference between standard and expanded form?
3. Why do we round numbers and how do we do it? When is it important to estimate?
4. How do we compare numbers using place value?
5. What are the standard U.S. traditional algorithms for addition and subtraction? How do they compare to familiar computation strategies? How do they connect to place value?
6. How can we use addition and subtraction to solve story problems?

Acquired Knowledge:

1. A digit in one place represents ten times what it represents in the place to its right.
2. Multi-digit numbers are composed of digits that represent different values.
3. Multi-digit numbers can be decomposed into parts (expanded form).
4. Symbols (>, =, <) can be used to record the results of comparing number values.
5. Numbers can be ‘rounded’ to the closest ten, hundred, thousand, etc.
6. The standard U.S. traditional algorithms for addition and subtraction are based on base-ten place value and the decomposing and recomposing of numbers.

**Acquired Skills:**

1. Read and write multi-digit whole numbers using base-ten numerals.
2. Read and write multi-digit whole numbers in number names.
3. Read and write multi-digit whole numbers in expanded form.
4. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, or < symbols.
5. Round numbers to any place.
7. Fluently subtract using the standard U.S. traditional algorithm.
9. Assess the reasonableness of answers based on mental computation and estimation strategies.

**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 5
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4

**Differentiation:**

**Enrichments**

- Students use random number generators to determine numbers to find in 1,000s books and find the difference between them
- Use larger numbers to demonstrate strategies and explain

**Supplements**

- LogoPaths: Missing Measures
- Construct 1,000 book
- Assessment 1.5
- Solving an addition problem 2 ways
- Numbers to 10,000
- Shark Attack!

**Assessed Benchmarks:**

- Read and write numbers to 1,000
- Add and Subtract multiples of 10 and 100 using 3-digit numbers
- Use of landmark numbers when using a number line for calculations
- Use of appropriate sized “chunks” when using a number line
- Sequence 2 and 3 digit numbers
• Use varied addition strategies accurately and efficiently and be able to record strategies and solutions clearly
• Use place value strategies to add/subtract to 1,000
• Identify the pattern of numbers throughout the 100 charts
• Determine 3 different kinds of subtraction situations and use appropriate strategies for each
• Read and write numbers to 10,000
• Sequence 4 digit numbers
• Add multiples of 10, 100, 1,000 to 4-digit numbers
• Combine positive and negative numbers
• Extended Constructed Response: The Role of Place Value, Decomposing and Recomposing in the Standard U.S. Traditional Algorithms for Addition

List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

4.OA.3  4.NBT.1-4

Suggested Learning Experiences and Instructional Activities:

• Construct 1,000 book and find given numbers on a chart
• Introduce Changing Places
• Add and Subtract 10s and 100s
• A problem about distance
• How many miles to 1,000?
• How Many Miles?
• Sharing Strategies
• Starter problems
• Make equivalent problems
• Using appropriate notation
• The U.S. Algorithm for Addition
• Close to 1,000
• How Many Hundreds are in 10,000?
• Make rows of 1,000
• How Many 10s are in 10,000
• Find numbers on the 10,000 chart
• Changing Places on the 10,000 chart
• Planning a road trip
• Work with numbers in the hundreds and thousands
• Use strategies to add numbers in the thousands
• Subtraction story problems
• Strategies for subtraction
• Do I add or subtract?
Technology:

- Subtraction examples and practice: [http://www.aaastudy.com/sub.htm#topic46](http://www.aaastudy.com/sub.htm#topic46)
- Place value examples and practice: Identifying place value [http://www.aaamath.com/g41a_px1.htm](http://www.aaamath.com/g41a_px1.htm), [www.helpingwithmath.com](http://www.helpingwithmath.com)
- Comparing whole numbers practice: [www.adaptedmind.com](http://www.adaptedmind.com)

Ten-Minute Math:

- Broken Calculator
- Practicing Place Value
Unit 3: Multiplication and Division

Why Is This Unit Important?

This unit focuses the development of computational fluency with multiplication and division. It focuses on students’ use of their knowledge of the structure of place value and the base ten number system. There is an emphasis on problem solving and interpreting remainders in the contexts of the story problems. The big ideas in this unit are:

- Multiplication and division are inversely connected
- Multiplication and division can be represented with arrays, area models and equations
- Multiplication and division can be solved by decomposing and recomposing strategies, where doing so by place value methods best supports advanced mathematics

Enduring Understandings:

1. Understand how drawings, arrays, area models and equations can support problem solving involving multiplication and division
2. Understand ways to interpret what a remainder is in division
3. Understand distributive property; multiplying parts of a larger number will result in partial products that may be combined to find the final product

Essential Questions:

1. How can we use arrays and break-apart strategies to solve larger multiplication problems?
2. How are multiplication and division connected?
3. How can we use arrays and break-apart strategies to solve larger division problems?
4. What do we do with remainders (‘leftovers’) in division situations?
5. How can we use multiplication and division to solve story problems?

Acquired Knowledge:

1. Numbers can be split apart in a variety of ways, including by place value.
2. Distributive property is utilized when multiplying parts of a larger number will result in partial products that may be combined to find the final product.
3. Multiplication and division are inverse operations.
4. Multiplication can be used to solve division problems.
5. Related vocabulary: factor, product, dividend, divisor, quotient and remainder.
6. The concept of remainders.
7. Remainders may be dealt with in a variety of ways, based on the context of the situation.

**Acquired Skills:**

1. Multiply or divide to solve story problems, using break apart strategies by place value, drawings and equations with a symbol for the unknown number.
2. Solve multi-step story problems using multiplication and division, including problems in which remainders must be interpreted.
3. Assess the reasonableness of answers based on mental computation and estimation strategies.
4. Multiply a whole number of up to four digits by a one-digit number using break apart strategies by place value, arrays, equations and/or area models.
5. Multiply two two-digit numbers using break apart strategies by place value, arrays, equations, and/or area models.
6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors using multiplication break-apart strategies, place value knowledge, arrays, equations and/or area models.

**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Units 3 and 8
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4

**Differentiation:**

**Enrichments**

- Label multiples according to the perceived relationship (i.e., the 12th multiple of 35 could be \((10 \times 35) + (2 \times 35)\))
- Work with small 3-digit numbers
- Work with triples and thirds
- Develop own “Closest Estimate” problems to share
- Use a 2-digit and 3-digit factor

**Supplements**

- Multiplication Cards
- Quick Images
- Factor Bingo

**Assessed Benchmarks:**

- Solve multiplication problems using a variety of strategies
- Match parts of arrays with partial products
- Break apart larger arrays into smaller ones
- Solve 1-digit x 2-digit multiplication using array strategy
• Use multiplication number sentences to solve division problems
• Write and solve division problems
• Use story problems, pictures, or concrete models to represent division situations
• Calculate landmark multiples and use them to find other multiples
• Use representations to explain the mathematical relationships between two problems such as $3 \times 4$ and $3 \times 40$
• Assessment: Multiplication Combinations
• Use a story problem represented by a multiplication expression to keep track of parts of a problem
• Solve 2-digit multiplication problems by breaking a problem into smaller parts and combining the partial products
• Extended Constructed Response: The Inverse Relationship Between Multiplication and Division

List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

4.OA.2  4.OA.3  4.NBT.5  4.NBT.6

Suggested Learning Experiences and Instructional Activities:

• Solve multiplication problems using a variety of strategies
• Make big arrays
• Play “Small Array/Big Array”
• Use arrays to model multiplication
• Solve division problems using a variety of strategies
• Make sense of remainders in terms of the problem context
• Use strategy of missing factor for division equations
• Use strategy of making groups of the divisor to solve division problems
• Multiply by a multiple of 10 and understand the effect on one of the factors and the relationship
• Construct Multiple Towers
• Represent a multiplication or division problem with pictures, diagrams, or models
• Determine what “adding a zero” means
• Determine the effect on a product when a factor is doubled or halved
• Develop strategies for multiplying and dividing that involve breaking apart numbers and cluster problems
• Closest estimate - develop accurate estimation skills
• Play “Factor Bingo”
• Use the strategy of changing one factor to create an easier problem
• Use strategies to multiply 2-digit multiplication problems
• Use the relationship between multiplication and division to solve division problems
• Use a story problem represented by a multiplication or division expression to keep track of parts of the problem
Technology:

- See resources for Unit A
- Relationship of Multiplication and Division (explanation and practice): [http://www.aaamath.com/g4_34cx1.htm](http://www.aaamath.com/g4_34cx1.htm), [http://www.aaamath.com/g4_34dx1.htm](http://www.aaamath.com/g4_34dx1.htm)
- Break-Apart Multiplication Strategy (demonstration): [http://www.humbleisd.net/page/2340](http://www.humbleisd.net/page/2340)
- Multiplication by 2-digits (explanation): [http://www.eduplace.com/math/mw/background/5/03/te_5_03_overview.html](http://www.eduplace.com/math/mw/background/5/03/te_5_03_overview.html)
- Playing with Remainders (plays for explanation and worksheets): [http://www.uen.org/Lessonplan/preview.cgi?LPid=18900](http://www.uen.org/Lessonplan/preview.cgi?LPid=18900)

Ten-Minute Math:

- Quick Images
- Counting Around the Class
- Closest Estimate
Unit 4: Concepts of Fractions and Decimals

Why Is This Unit Important?

This unit focuses on the concepts of fractions and decimals. Students work to understand fractions as equal parts, identify equivalent fractions and decompose fractions. The unit also includes study of the scope of fractions in relation to whole numbers. Students will compare fractions and decimals. Work throughout this unit should focus on visual fraction models to help students build understanding and reasoning skills about fractions and decimals. The big ideas in this unit are:

- Fractions and decimals are numbers that represent a quantity that are parts of a whole and the whole can vary in context such as an object, set of objects, measure or a number
- A fraction or decimal is not meaningful without knowing what the whole is
- Equal is not necessarily identical (the equal parts into which a whole or set is divided do not have to be identical)
- Different fractions can represent the same amount
- Decimals are an alternative representation to fractions, but one that allows for modeling, comparisons and calculations that are consistent with whole numbers because decimals extend the pattern of the base ten place value system

Enduring Understandings:

1. Understand relative size of fractions in relationship to wholes and in relationship to other fractions
2. Understand how fractions and decimals are equal parts of a given whole (specifically that 1/5 means 1 out of 5 equal pieces and 0.1 means 1 out of 10 equal pieces)
3. Understand notation for fractions, improper fractions, mixed numbers
4. Understand how fractions can be decomposed
5. Understand how renaming fractions is often the key to comparing them or computing with them; every fraction can be renamed in an infinite number of ways
6. Understand equivalency
7. Understand the concept of decimals
8. Understand how fractions and decimals that symbolically are identical are not necessarily equivalent (1/5 of a whole may be more or less than 1/5 of a different whole and 0.1 of a whole may be more or less than 0.1 of a different whole)
9. Understand the relationship between fractions and decimals
10. Understand notation for decimals and the connection to place value
Essential Questions:

1. What is the size of a fraction? How does it compare to whole numbers?
2. How are fractions and whole numbers connected?
3. What is a mixed number? What is an improper fraction?
4. How can different fractions represent the same amount? What are equivalent fractions?
5. How do different fractions compare to one another?
6. How can we decompose or compose a fraction?
7. What is a decimal? What is the relationship between fractions and decimals?

Acquired Knowledge:

1. Fractions are used to show a portion of a whole.
2. A fraction comes between two whole numbers.
3. Whole numbers may be combined with fractions to make mixed numbers; understand that these mixed numbers may be expressed as improper fractions.
4. Fractions can be equivalent.
5. Fractions can be compared.
6. The addition and subtraction of fractions involve joining and separating parts of the same whole (or equivalent parts of different wholes).
7. The relationship between fractions and decimals and decimals can also be used to show a portion of a whole.

Acquired Skills:

1. Identify equivalent fractions using visual fraction models.
2. Identify the relative size of a fraction by identifying its location on a number line.
3. Identify between which two whole numbers a fraction is located.
4. Compare fractions with different numerators and different denominators using models, benchmark fractions and by creating common denominators or numerators.
5. Decompose a fraction into a sum of fractions with the same denominator and record as an equation (e.g., \( \frac{3}{8} = \frac{1}{8} + \frac{1}{8} \) or \( \frac{2}{8} = \frac{1}{8} + \frac{1}{8} \) and \( 2\frac{1}{8} = 1 + 1 + \frac{1}{8} \)).
6. Express a fraction with a denominator 10 as an equivalent fraction with a denominator 100 (e.g., \( \frac{3}{10} = \frac{30}{100} \)).
7. Use the decimal notation for fractions with the denominator 10 or 100 (e.g., rewrite 0.62 as \( \frac{62}{100} \)).
8. Compare two decimals to hundredths by reasoning about their size.
9. Record the results of comparison of fractions or decimals using the symbols <, > or =.
10. Justify conclusions by using a visual model or reasoning.
**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 6
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Fraction Bars

**Differentiation:**

**Enrichments**
- Find equivalent fractions using multiples of a denominator, based on an area model
- Add additional, unfamiliar fractions to the number line

**Supplements**
- Fraction Bars
- Hundredths Grid
- Fraction Cards

**Assessed Benchmarks:**

- Find fractional parts of a rectangle using unit fractions
- Find fractional parts of a rectangle combining unit fractions
- Interpret the meaning of a fraction in the context of area
- Use strategies to find fractional parts of a given rectangle
- Order fractions and decimals and justify reasoning through fraction and decimal equivalencies and relationships
- Represent fractions using a number line
- Compare fractions to the landmarks 0, $\frac{1}{2}$, 1 and 2
- Extended Constructed Response: *Fraction and Decimal Equivalence*

**List of Applicable Common Core State Standards for Mathematics Covered in This Unit:**

4.NF.1  4.NF.2  4.NF.3a,b  4.NF.5-7

**Suggested Learning Experiences and Instructional Activities:**

- Find fractional parts of a rectangular area
- Interpret the meaning of the numerator and denominator
- Play “Cover Up”
- Identify equivalent fractions
- Play “Uncover 1”
• Play “Uncover 2”
• Find fractions parts of a group
• Read, write and apply fraction notation
• Compare the same fractional parts of different-sized wholes
• Use representations to add fractions that sum to 1
• Add fractions with the same and related denominators using visual models
• Play “Pick 2”
• Play “Roll 5”
• Use Fraction Cards to compare and order fractions and mixed numbers
• Order fractions and decimals and justify reasoning using fraction and decimal equivalencies and relationships
• Play “Capture Fractions”
• Compare fractions to landmarks $0, \frac{1}{2}, 1$ and 2
• Represent fractions using a number line
• Identify everyday uses of fractions and decimals
• Read and write decimals to tenths and hundredths and represent tenths and hundredths as parts of an area
• Play “Decimal Compare”
• Use visual models to combine tenths and hundredths
• Play “Fill Two”
• Estimate sums of decimal numbers
• Runners’ Logs

Technology:

• Decimal practice:  http://www.ixl.com/math/grade-4/understanding-decimals-expressed-in-words
• Equivalent fraction practice:  http://www.ixl.com/math/grade-3/equivalent-fractions-type-missing-numerator-or-denominator
• Fractions lesson power point:  http://vdc.engr.scu.edu/KnowItAll/FourthGrade/fourthMath/4thGradeFractionLessons.html
• Fraction tutorial:  http://www.kidsolr.com/math/fractions.html
• Fresh Baked Fractions:  http://www.funbrain.com/cgi-bin/fob.cgi?A1=a&A2=0&A11=0&A12=1
• Fractional parts practice:  http://www.homeschoolmath.net/teaching/f/part-of-whole-group.php
• Virtual fraction manipulatives and games:  http://visualfractions.com/

Ten-Minute Math:

• Practicing Place Value
• Quick Survey
Unit 5: Using Fractions

Why Is This Unit Important?

This unit focuses on the application of fractions. Students work to understand how fractions are used in real-life situations. There is an emphasis on problem-solving using fractions. The unit continues to explore adding and subtracting fractions, while introducing multiplication of fractions by whole numbers. Work throughout this unit should continue to focus on visual fraction models to help students build understanding and reasoning skills about computation with fractions. The big ideas in this unit are:

- Life rarely works out in convenient whole numbers; fractions are critical to most real-life situations
- Renaming fractions is often the key to computing with them
- Every fraction can be renamed in an infinite number of ways
- There are multiple models and/or procedures for computing with fractions, just as there are with whole numbers
- Operations with fractions have the same meanings as operations with whole numbers, even though the algorithms differ

Enduring Understandings:

1. Understand how the concept of fractions can be used to solve problems
2. Understand how visual models can be used to represent and justify computation with fractions
3. Understand how computations can be performed with fractions and these computations can be recorded with equations

Essential Questions:

1. How do we use fractions in life? How do we solve problems involving fractions?
2. When might we need to add and subtract fractions or mixed numbers?
3. How do we add and subtract fractions? How do we add and subtract mixed numbers?
4. When might we need to multiply fractions?
5. How do we multiply fractions?

Acquired Knowledge:

1. Fractions may be added or subtracted.
2. A fraction is a multiple of its unit fraction (e.g., \( \frac{a}{b} \) is a multiple of \( \frac{1}{b} \)).
3. Fractions may be multiplied.
4. A multiple of a fraction is a multiple of its unit fraction and use this to multiply a fraction by a whole number (e.g., recognize $3 \times \frac{2}{6}$ is the same as $6 \times \frac{1}{5}$ and the product is $\frac{5}{5}$; in general, $n \times \left(\frac{a}{b}\right) = \frac{na}{b}$).

Acquired Skills:

1. Add and subtract fractions and mixed numbers with like denominators.
2. Solve story problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
3. Represent a fraction as a multiple of its unit fraction using a visual model (e.g., $\frac{5}{4}$ is a product of $5 \times \frac{1}{4}$).
4. Record the conclusion as an equation (e.g., $\frac{5}{4} = 5 \times \frac{1}{4}$).
5. Multiply a fraction by a whole number (e.g., $3 \times \frac{2}{5}$).
6. Solve story problems involving multiplication of a fraction by a whole number using visual models and equations.

Instructional Materials:

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 6 (1.7)
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Fraction Bars, Fraction Circles
- Decimal Grids

Differentiation:

Enrichments
- Use unfamiliar fractions to add and subtract using various models

Supplements
- Fraction Bars
- Fraction Circles

Assessed Benchmarks:

- Find sums and differences of fractions, using visual models
- Solve story problems using addition and subtraction of fractions
- Represent fractions as multiples of unit fractions
- Multiply fractions by whole numbers using visual models and reasoning
- Extended Constructed Response: Computing with Fractions
List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

4.NF.3c,d  4.NF.4a,b,c

Suggested Learning Experiences and Instructional Activities:

• More or Less than 1?
• Use Fraction Bars and to add and subtract fractions with like denominators
• Use Fraction Circles to add and subtract fractions with like denominators
• Play “Roll 5”
• Use unit fractions to express fractions that are multiples of a given unit fraction
• Use visual models to show equivalency of mixed numbers and improper fractions
• Use visual model to multiply a fraction by a whole number
• Play “Get to 2” using area model
• Play “Get to 2” using linear model

Technology:

• See resources for Unit D
• Everyday Uses of Fractions:
• Adding Fractions:
• Subtracting Fractions:
• Multiplying Fractions:

Ten-Minute Math:

• Practicing Place Value
• Quick Survey
Unit 6: Measurement and Data

Why Is This Unit Important?

This unit focuses on measurement concepts and the application of measurement. There is an emphasis on converting measurements. The unit also explores perimeter and area. Students will work to organize measurement data in a variety of ways. The big ideas in this unit are:

- Units are used to standardize the process of measurement
- Measurement is a means for describing and comparing objects for a variety of attributes
- Concepts can be measured such as time and temperature
- While units are arbitrarily designated descriptions, differing units for a given attribute can be mathematically related to one another

Enduring Understandings:

1. Understand how objects can be measured using length, volume or mass
2. Intervals of time can also be measured
3. Understand the relationships between measurement units
4. Understand how to convert between measurements
5. Understand the concept of perimeter and how to find perimeter
6. Understand the concept of area and how to find area
7. Understand how to organize and plot measurement data

Essential Questions:

1. How can objects be measured?
2. How do the sizes of measurement units relate to one another?
3. What is perimeter? When is perimeter used in real life?
4. What is area? When is area used in real life?
5. How can measurement data be organized?

Acquired Knowledge:

1. An object can be measured for a variety of attributes such as length, volume or mass.
2. Time can be used as a unit of measure.
3. An attribute can be measured using different units (e.g., a length can be measured in km, cm, m).
4. Know relative sizes of measurement units within one system of units, including km, cm, m, kg, g, lbs., oz., L, mL, hours, minutes and seconds.
5. Objects can be measured in one dimension, such as to measure length of a side or perimeter of a figure.
6. Objects can be measured in two dimensions, such as to determine the area of a figure.
7. Measurement data can be organized in a variety of ways, such as tables and line plots.

**Acquired Skills:**

1. Express measurements in a larger unit in terms of a smaller unit (e.g., 1 foot is 12 times as long as 1 inch).
2. Record measurement equivalents in a two-column table.
3. Generate a conversion table for feet and inches.
4. Use the four operations to solve story problems involving distances, intervals of time, liquid volumes, masses of objects and money, including problems involving simple fractions or decimals.
5. Represent measurement quantities using diagrams, such as number line diagrams that feature a measurement scale.
6. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.
7. Make a line plot to display a data set of measurements in fractions of a unit\(\left(\frac{1}{2},\frac{1}{4},\frac{1}{6}\right)\). Solve problems involving addition and subtraction of fractions by using information presented in the line plot.

**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 4, Investigations 1 & 4
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4

**Differentiation:**

**Enrichments**
- Use measurement units that are multiples or unfamiliar to students

**Supplements**
- LogoPaths: Introducing Missing Measures
- Clock template
- “Today’s Object” template
- LogoPaths: Introducing Mazes
- Geoboards
Assessed Benchmarks:

- Accurately convert units within a measurement system
- Accurately read measurement tools
- Use measurement tools in LogoPaths effectively
- Calculate perimeter and area of rectangles
- Calculate the area of polygons using square units and decomposing shapes
- Solve problems using intervals of time, liquid volume, mass and money
- Solve problems using data from line plots represented as fractions
- Extended Constructed Response: *Area versus Perimeter*

List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

4.MD.1-4

Suggested Learning Experiences and Instructional Activities:

- Estimate lengths based on benchmarks
- Use U.S. standard and metric units to accurately measure length
- Express measurements in a larger unit in terms of a smaller unit and use a two-column table to record; relate to previous work during 10-minute math
- Determine when estimates or exact measurements are needed
- Accurately use measurement tools
- LogoPaths: Introducing Missing Measures
- Find perimeter using standard units and compare different paths that have the same length
- Determine area of rectangles and relate to previous work with multiplication equations
- Solve story problems involving distances, time, liquid volume, mass and money, including problems involving simple fractions or decimals
- Use measurements to create a line plot and solve problems based on the information presented in fraction form
- Recognize that the larger the unit of area, the smaller the number of units needed to measure the area
- Divide irregular polygons into two shapes that have equal area
- Find the area of polygons by decomposing shapes

Technology:

- [http://www.sheppardsoftware.com/math.htm](http://www.sheppardsoftware.com/math.htm)
- [www.mathplayground.com](http://www.mathplayground.com)
Ten-Minute Math:

- Today’s Number: Broken Calculator
- Quick Images: 2D
- “Today’s Object”
Unit 7: Geometry

Why Is This Unit Important?

This unit focuses on attributes of two-dimensional figures and how these attributes determine classification of figures. Angles will be a major topic in this unit, as students will measure, draw and classify angles. Students will also examine points, lines, line segments and rays. Parallel and perpendicular lines will be identified, as will lines of symmetry. The big ideas in this unit are:

- Geometric figures can be analyzed and classified based on their properties (such as having parallel sides, perpendicular sides, particular angle measures and symmetry)

Enduring Understandings:

1. Understand how two-dimensional figures are formed
2. Understand how angles are formed and how they make up two-dimensional figures
3. Understand how to classify angles based on their measure
4. Understand how to classify two-dimensional figures based on their attributes, including parallel and perpendicular lines, as well as angles
5. Understand symmetry and how to identify lines of symmetry

Essential Questions:

1. What are angles and how are they measured?
2. How do angles make up parts of two-dimensional figures?
3. How can angles be classified? What types of angles are in given two-dimensional figures?
4. How are two-dimensional figures formed with points, lines, line segments and rays?
5. What are parallel and perpendicular lines? What two-dimensional figures have these types of lines?
6. What is symmetry? How can we identify a line of symmetry? What two-dimensional figures have lines of symmetry?

Acquired Knowledge:

1. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint.
2. 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.
3. An angle that turns $\frac{1}{360}$ of a circle is called a ‘one-degree angle’ and can be used to measure angles.
4. An angle that turns through $n$ one-degree angles is said to have a measure of $n$ degrees.
5. Recognize angle measure as additive. Angles can be decomposed into non-overlapping parts; the angle measure of the whole is the sum of the angle measures of the parts.
6. Recognize angles as right, acute, or obtuse and that a right angle is a 90 degree angle.
7. The difference between points, lines, line segments, rays.
8. Two-dimensional figures are composed of points, lines, line segments, rays and angles; figures can be classified by these attributes.
9. The difference between perpendicular and parallel lines.
10. The relationship between lines, line segments, or rays can sometimes be classified as parallel or perpendicular.
11. Some two-dimensional figures have line symmetry. An object with line symmetry can be segmented into parts that are mirror images of each other.
12. Right triangles are a category.

**Acquired Skills:**

1. Measure angles in whole number degrees using a protractor.
2. Sketch angles of specified measure.
3. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.
4. Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines.
5. Identify points, lines, line segments, rays, angles and perpendicular and parallel lines in two-dimensional figures.
6. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines.
7. Classify two-dimensional figures based on the presence or absence of angles of a specified size.
8. Identify right triangles.
9. Recognize a line of symmetry for two-dimensional figures.
10. Identify line symmetric figures and draw lines of symmetry.

**Instructional Materials:**

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4, Unit 4
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
Differentiation:

Enrichments
• Make a series of related shapes based on number of sides
• Use LogoPaths to create rectangles of varying smaller perimeters
• Use LogoPaths to create rectangles with perimeters of 800 steps

Supplements
• Protractors
• Circle Template
• Geometric Shapes Template
• LogoPaths – 600 steps
• 2-D figures for symmetry

Assessed Benchmarks:
• Identify and classify polygons
• Identify and classify quadrilaterals
• Use a protractor to measure angles
• Construct angles of a given measure
• Extended Constructed Response: Angle Fun

List of Applicable Common Core State Standards for Mathematics Covered in This Unit:

4.MD.5a,b 4.MD.6-7 4.G.1-3

Suggested Learning Experiences and Instructional Activities:

• Draw points, lines, segments, rays, perpendicular and parallel lines
• Define and classify polygons according to attributes
• Play “Guess My Rule” with polygons and quadrilaterals
• Use Geometric Shapes Template to classify polygons
• Combine polygons to make new polygons and recognize that number of sides as a descriptor
• Define and classify quadrilaterals according to attributes, including defining and classifying rectangles and squares
• Use circle template to create angles of varying measures, using a protractor, identify right, acute and obtuse angles
• Use a protractor to measure angles of Power Polygons
• Use known angles to estimate the measure of other angles
• Solve addition and subtraction problems to find unknown angles on a diagram
• Sketch angles of a specified measure
• Fold given 2D figures to determine lines of symmetry
• Construct symmetrical designs
Technology:

- http://www.sheppardsoftware.com/math.htm
- www.mathplayground.com
- www.Jmathpage.com
- www.ixl.com/math
- www.mrnussbaum.com

Ten-Minute Math:

- Today’s Number: Broken Calculator
- Quick Images: 2D