MATHEMATICS
GRADE 4

EWING PUBLIC SCHOOLS
2099 Pennington Road
Ewing, NJ 08618

Board Approval Date: November 25, 2019 Michael Nitti
Revised by: District Math Staff Superintendent

In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.

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Course Description and Rationale

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.

Students will use the following eight Mathematics Practices to demonstrate understanding of the mathematics process:

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

This course is a year-long course that meets for 60 minutes per day. The course uses 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 though 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 below; enabling their future success in mathematics.

The course content is arranged into four units of study:

- Unit 1: Number and Operations in Base Ten
- Unit 2: Multiplication and Division
- Unit 3: Fractions and Decimals
- Unit 4: Measurement, Data , and Geometry

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.

21st Century Skills - During this course, students will work on developing, to an age appropriate level, the following 21st century skills:

Career Readiness Pathways:

- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP12. Work productively in teams while using cultural global competence.

Learning and Innovation Skills:

Creativity and Innovation:

Think Creatively

- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

CRITICAL THINKING AND PROBLEM SOLVING:

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis

Solve Problems

- Identify and ask significant questions that clarify various points of view and lead to better solutions

COMMUNICATION AND COLLABORATION:

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Information, Media, and Technology Skills:

Informational Literacy:

Access and Evaluate Information

- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand

Life and Career Skills:

Social and Cross-Cultural Skills

Interact Effectively with Others

- Know when it is appropriate to listen and when to speak

Work Effectively in Diverse Teams

- Respond open-mindedly to different ideas and values

Be Responsible to Others

- Act responsibly with the interests of the larger community in mind

Technology Integration:

8.1 Educational Technology
All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

ELA Integration:

RI.4.1. Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
RI.4.4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.
RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
SL.4.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

A. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
B. Follow agreed-upon rules for discussions and carry out assigned roles.
C. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
D. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

SL.4.2. Paraphrase portions of a text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).

Unit 1: Number & 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:

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

Essential Questions:

- How does the number system work? What is the connection between value of a number and its place?
- What is the difference between standard and expanded form?
- Why do we round numbers and how do we do it? When is it important to estimate?
- How do we compare numbers using place value?
- 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?
- How can we use addition and subtraction to solve story problems?

Acquired Knowledge:

- A digit in one place represents ten times what it represents in the place to its right.
- Multi-digit numbers are composed of digits that represent different values.
- Multi-digit numbers can be decomposed into parts (expanded form).
- Symbols (>, =, <) can be used to record the results of comparing number values.
- Numbers can be 'rounded' to the closest ten, hundred, thousand, etc.
- 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:

- Read and write multi-digit whole numbers using base-ten numerals.
- Read and write multi-digit whole numbers in number names.
- Read and write multi-digit whole numbers in expanded form.
- Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, or < symbols.
- Round numbers to any place.
- Fluently add using the standard U.S. traditional algorithm.
- Fluently subtract using the standard U.S. traditional algorithm.
- Solve multi-step story problems using addition and subtraction.
- 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
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Chart Paper
- Color Tiles
- Communicators
- Counters – 2 color
- Dice
    - 6 sided
    - 10 sided

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!

Assessments:

Formative Assessments:

- Assessment Checklist for Place Value Addition
- Assessment Checklist for Place Value Subtraction
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Q1 Assessments

Benchmarks:

- Quarterly Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.4.NBT.A.1
- NJSLS.4.NBT.A.2
- NJSLS.4.NBT.A.3
- NJSLS.4.NBT.B.4
- NJSLS.4.OA.C.5
- NJSLS.MP.1-8

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:

- Addition fact practice: http://www.aaamath.com/g41a_px1.htm
- Subtraction examples and practice: http://www.aaastudy.com/sub.htm#topic46
- Place value examples and practice: Identifying place value http://www.aaamath.com/g41a_px1.htm, www.helpingwithmath.com
- Comparing whole numbers practice: www.adaptedmind.com
- Rounding numbers practice: http://www.adaptedmind.com/p.php?tagId=546

Unit 2: 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:

- Understand how drawings, arrays, area models and equations can support problem solving involving multiplication and division
- Understand ways to interpret what a remainder is in division
- 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:

- How can we use arrays and break-apart strategies to solve larger multiplication problems?
- How are multiplication and division connected?
- How can we use arrays and break-apart strategies to solve larger division problems?
- What do we do with remainders ('leftovers') in division situations?
- How can we use multiplication and division to solve story problems?

Acquired Knowledge:

- Numbers can be split apart in a variety of ways, including by place value.
- 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.
- Multiplication and division are inverse operations.
- Multiplication can be used to solve division problems.
- Related vocabulary: factor, product, dividend, divisor, quotient and remainder.
- The concept of remainders.
- Remainders may be dealt with in a variety of ways, based on the context of the situation.

Acquired Skills:

- Multiply or divide to solve story problems, using break apart strategies by place value, drawings and equations with a symbol for the unknown number.
- Solve multi-step story problems using multiplication and division, including problems in which remainders must be interpreted.
- Assess the reasonableness of answers based on mental computation and estimation strategies.
- 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.
- Multiply two two-digit numbers using break apart strategies by place value, arrays, equations, and/or area models.
- 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
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Chart Paper
- Color Tiles
- Communicators
- Counters – 2 color
- Dice
    - 6 sided
    - 10 sided

Differentiation:

Enrichments:

- Label multiples according to the perceived relationship (i.e., the 12^{th} multiple of 35 could be (10x35) + (2x35)
- 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

Assessments

Formative Assessments:

- Assessment Checklist for Place Value Multiplication
- Assessment Checklist for Place Value Division
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Q2 Assessments

Benchmarks:

- Quarterly Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.4.NBT.B.5
- NJSLS.4.NBT.B.6
- NJSLS.4.OA.A.1
- NJSLS.4.OA.A.2
- NJSLS.4.OA.A.3
- NJSLS.4.OA.B.4
- NJSLS.MP.1-8

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_34dx1.htm
- Multiplication by 2-digits (explanation): 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
- Partial Quotients Division iPhone Math App: http://idevbooks.com/apps/quotients.php
- Animation of Algorithms: https://www.everydaymathonline.com/free_resources_main.html?frnologin=1

Unit 3: 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
- 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:

- Understand relative size of fractions in relationship to wholes and in relationship to other fractions
- 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)
- Understand notation for fractions, improper fractions, mixed numbers
- Understand how fractions can be decomposed
- 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
- Understand equivalency
- Understand the concept of decimals
- 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)
- Understand the relationship between fractions and decimals

- Understand notation for decimals and the connection to place value
- Understand how the concept of fractions can be used to solve problems
- Understand how visual models can be used to represent and justify computation with fractions
- Understand how computations can be performed with fractions and these computations can be recorded with equations

Essential Questions:

- What is the size of a fraction? How does it compare to whole numbers?
- How are fractions and whole numbers connected?
- What is a mixed number? What is an improper fraction?
- How can different fractions represent the same amount? What are equivalent fractions?
- How do different fractions compare to one another?
- How can we decompose or compose a fraction?
- What is a decimal? What is the relationship between fractions and decimals?
- How do we use fractions in life? How do we solve problems involving fractions?
- When might we need to add and subtract fractions or mixed numbers?
- How do we add and subtract fractions? How do we add and subtract mixed numbers?
- When might we need to multiply fractions?
- How do we multiply fractions?

Acquired Knowledge:

- Fractions are used to show a portion of a whole.
- A fraction comes between two whole numbers.
- Whole numbers may be combined with fractions to make mixed numbers; understand that these mixed numbers may be expressed as improper fractions.
- Fractions can be equivalent.
- Fractions can be compared.
- The addition and subtraction of fractions involve joining and separating parts of the same whole (or equivalent parts of different wholes).
- The relationship between fractions and decimals and decimals can also be used to show a portion of a whole.
- Fractions may be added or subtracted.
- A fraction is a multiple of its unit fraction (e.g., $\frac{a}{b}$ is a multiple of $\frac{1}{b}$).
- Fractions may be multiplied.
- 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 x $\frac{2}{5}$ is the same as 6 x $\frac{1}{5}$ and the product is $\frac{6}{5}$; in general, *n* x ($\frac{a}{b}$) = $\frac{n \times a}{b}$.

Acquired Skills:

- Identify equivalent fractions using visual fraction models.
- Identify the relative size of a fraction by identifying its location on a number line.
- Identify between which two whole numbers a fraction is located.
- Compare fractions with different numerators and different denominators using models, benchmark fractions and by creating common denominators or numerators.
- Decompose a fraction into a sum of fractions with the same denominator and record as an equation (e.g., $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$ or $\frac{3}{8} = \frac{2}{8} + \frac{1}{8}$ and $2\frac{1}{8} = 1 + 1 + \frac{1}{8}$
- Express a fraction with a denominator 10 as an equivalent fraction with a denominator 100 (e.g., $\frac{3}{10} = \frac{30}{100}$
- Use the decimal notation for fractions with the denominator 10 or 100 (e.g., rewrite 0.62 as $\frac{62}{100}$
- Compare two decimals to hundredths by reasoning about their size.
- Record the results of comparison of fractions or decimals using the symbols <, > or =.
- Justify conclusions by using a visual model or reasoning.
- Add and subtract fractions and mixed numbers with like denominators.
- Solve story problems involving addition and subtraction of fractions referring to the same whole and having like denominators.
- Represent a fraction as a multiple of its unit fraction using a visual model (e.g., $\frac{5}{4}$ is a product of $5 \times \frac{1}{4}$).
- Record the conclusion as an equation (e.g., $\frac{5}{4} = 5 \times \frac{1}{4}$).
- Multiply a fraction by a whole number (e.g., $3 \times \frac{2}{5}$).
- 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
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Chart Paper
- Color Tiles
- Communicators
- Counters – 2 color
- Dice
    - 6 sided
    - 10 sided
- Fraction Bars
- Fraction Circles
- Decimal Grids

Differentiation:

Enrichments:

- Find equivalent fractions using multiples of a denominator, based on an area model
- Add additional, unfamiliar fractions to the number line
- Use unfamiliar fractions to add and subtract using various models

Supplements:

- Fraction Bars
- Fraction Circles
- Hundredths Grid
- Fraction Cards

Assessments

Formative Assessments:

- Assessment Checklist for Fraction Conversion
- Assessment Checklist for Fraction Addition
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Q3 Assessments

Benchmarks:

- Quarterly Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.4.NF.A.1
- NJSLS.4.NF.A.2
- NJSLS.4.NF.B.3
- NJSLS.4.NF.B.4
- NJSLS.4.NF.C.5
- NJSLS.4.NF.C.6
- NJSLS.4.NF.C.7
- NJSLS.MP.1-8

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, ½ , 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
- 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
- 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:

- Decimal practice: http://www.ixl.com/math/grade-4/understanding-decimals-expressed-in-words
- Ordering decimals: http://www.ixl.com/math/grade-4/put-decimal-numbers-in-order
- Equivalent fraction practice: http://www.ixl.com/math/grade-3/equivalent-fractions-type-missing-numerator-or-denominator
- 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/
- Everyday Uses of Fractions:
- Article: http://www.mathworksheetscenter.com/mathtips/fractionseveryday.html
- Adding Fractions:
- Tutorial: http://www.mathsisfun.com/fractions_addition.html,
- Overview: http://www.math.com/school/subject1/lessons/S1U4L3GL.html, Explanation and Game: http://www.mathplayground.com/fractions_add.html, Games: http://www.softschools.com/math/games/fractions_practice.jsp and http://www.sheppardsoftware.com/mathgames/fractions/FruitShootFractionsAddition.htm
- Subtracting Fractions:
- Tutorial: http://www.mathsisfun.com/fractions_subtraction.html
- Overview: http://www.math.com/school/subject1/lessons/S1U4L3GL.html
- Explanation and Game: http://www.mathplayground.com/fractions_sub.html
- Explanation and Practice: http://www.aaastudy.com/fra66lx2.htm
- Games: http://www.softschools.com/math/games/fractions_subtraction.jsp and http://www.math-play.com/adding-and-subtracting-fractions-game.html
- Multiplying Fractions:
- Tutorial: http://www.mathsisfun.com/fractions_multiplication.html
- Overview: http://www.math.com/school/subject1/lessons/S1U4L4GL.html
- Explanation and Practice: http://www.aaamath.com/fra66mx2.htm
- Game: http://www.mathplayground.com/fractions_mult.html

Unit 4: Measurement, Data, and Geometry

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. Finally students will explore 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:

- 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
- 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:

- Understand how objects can be measured using length, volume or mass
- Intervals of time can also be measured
- Understand the relationships between measurement units
- Understand how to convert between measurements
- Understand the concept of perimeter and how to find perimeter
- Understand the concept of area and how to find area
- Understand how to organize and plot measurement data
- Understand how two-dimensional figures are formed
- Understand how angles are formed and how they make up two-dimensional figures
- Understand how to classify angles based on their measure
- Understand how to classify two-dimensional figures based on their attributes, including parallel and perpendicular lines, as well as angles
- Understand symmetry and how to identify lines of symmetry

Essential Questions:

- How can objects be measured?
- How do the sizes of measurement units relate to one another?
- What is perimeter? When is perimeter used in real life?
- What is area? When is area used in real life?
- How can measurement data be organized?
- What are angles and how are they measured?
- How do angles make up parts of two-dimensional figures?

- How can angles be classified? What types of angles are in given two-dimensional figures?
- How are two-dimensional figures formed with points, lines, line segments and rays?
- What are parallel and perpendicular lines? What two-dimensional figures have these types of lines?
- What is symmetry? How can we identify a line of symmetry? What two-dimensional figures have lines of symmetry?

Acquired Knowledge:

- An object can be measured for a variety of attributes such as length, volume or mass.
- Time can be used as a unit of measure.
- An attribute can be measured using different units (e.g., a length can be measured in km, cm, m).
- 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.
- Objects can be measured in one dimension, such as to measure length of a side or perimeter of a figure.
- Objects can be measured in two dimensions, such as to determine the area of a figure.
- Measurement data can be organized in a variety of ways, such as tables and line plots.
- Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint.
- 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 $\frac{1}{360}$ of a circle is called a 'one-degree angle' and can be used to measure angles.
- An angle that turns through *n* one-degree angles is said to have a measure of *n* degrees.
- 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.
- Recognize angles as right, acute, or obtuse and that a right angle is a 90 degree angle.
- The difference between points, lines, line segments, rays.
- Two-dimensional figures are composed of points, lines, line segments, rays and angles; figures can be classified by these attributes.
- The difference between perpendicular and parallel lines.
- The relationship between lines, line segments, or rays can sometimes be classified as parallel or perpendicular.
- Some two-dimensional figures have line symmetry. An object with line symmetry can be segmented into parts that are mirror images of each other.
- Right triangles are a category.

Acquired Skills:

- Express measurements in a larger unit in terms of a smaller unit (e.g., 1 foot is 12 times as long as 1 inch).
- Record measurement equivalents in a two-column table.
- Generate a conversion table for feet and inches.
- 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.
- Represent measurement quantities using diagrams, such as number line diagrams that feature a measurement scale.
- Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.
- Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in the line plot.
- Measure angles in whole number degrees using a protractor.
- Sketch angles of specified measure.
- Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.
- Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines.
- Identify points, lines, line segments, rays, angles and perpendicular and parallel lines in two-dimensional figures.
- Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines.
- Classify two-dimensional figures based on the presence or absence of angles of a specified size.
- Identify right triangles.
- Recognize a line of symmetry for two-dimensional figures.
- Identify line symmetric figures and draw lines of symmetry.

Instructional Materials:

- Investigations in Number, Data and Space, Pearson Education, Inc., Grade 4
- Investigations in Number, Data and Space, Manipulatives Kit for Grade 4
- Investigations in Number, Data and Space, Cards Package for Grade 4
- Chart Paper
- Color Tiles
- Communicators
- Counters – 2 color
- Dice
    - 6 sided
    - 10 sided
- Geoblocks
- Meter Sticks
- Rulers

Differentiation:

Enrichments:

- Use measurement units that are multiples or unfamiliar to students
- 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:

- LogoPaths: Introducing Missing Measures
- Clock template
- "Today's Object" template
- LogoPaths: Introducing Mazes
- Geoboards
- Circle Template
- Geometric Shapes Template
- LogoPaths – 600 steps
- 2-D figures for symmetry

Assessments:

Formative Assessments:

- Assessment Checklist for Measurement Conversion
- Assessment Checklist for Data Representation
- Assessment Checklist for Perimeter
- Assessment Checklist for Area
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Q4 Assessments

Benchmarks:

- Quarterly Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

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

- NJSLS.4.MD.A.1
- NJSLS.4.MD.A.2
- NJSLS.4.MD.A.3
- NJSLS.4.MD.B.4
- NJSLS.4.MD.C.5
- NJSLS.4.MD.C.6
- NJSLS.4.MD.C.7
- NJSLS.4.G.A.1
- NJSLS.4.G.A.2
- NJSLS.4.G.A.3
- NJSLS.MP.1-8

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 unber 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
- 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
- http://illuminations.nctm.org/Activities.aspx?grade=2
- www.ixl.com/math
- www.mrnussbaum.com

Sample Standards Integration

21st Century Skills & Career Readiness Practices

CRP4. Communicate clearly and effectively and with reason.

For example, in Unit 2 students will justify their reasoning in their choice of multiplication and division strategies used.

CRP6. Demonstrate creativity and innovation.

For example, in Unit 4 students will create shapes and find ways to calculate perimeters and areas of their composite shapes.

CRP7. Employ valid and reliable research strategies.

For example, in Unit 4 students will select a question and gather data from the class; they will organize and represent the data and describe what they've learned from the data set.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

For example, in Unit 3 students will work to solve and understand real world applications applying their understandings of fraction and decimal operations to their solution models.

CRP12. Work productively in teams while using cultural global competence.

For example, in Unit 4 students will work in small teams to design a survey question, gather data, and present the findings.

8.1 Educational Technology

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

For example, in Unit 4 students will access, manage, evaluate, and synthesize information to develop models for geometric shapes and their manipulation.

Interdisciplinary Connections

RI.4.1. Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
RI.4.4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.
RI.4.7. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
These standards are met throughout the course. For example, in Unit 2 students will read stories to explore concepts relating multiplication and division.

SL.4.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

A. Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
B. Follow agreed-upon rules for discussions and carry out assigned roles.
C. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
D. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

SL.4.2. Paraphrase portions of a text read aloud or information presented in diverse media and formats (e.g.,visually, quantitatively, and orally).

These standards are met throughout the course. For example, in Units 1 and 2 students will discuss their solutions to a variety of story problems, listen to classmates' explanations, establish norms about math discussions, and work to develop conversation skills in responding to and building upon others' math ideas. In Units 3 and 4, students will ask and answer questions about information presented in various media, including videos about adding fractions and measurement.