



West Windsor-Plainsboro Regional School District

Grade 4 Mathematics

Updated August 2023

Math Equity Statement

ALL learners should have access to rigorous, high-level mathematical content in an environment where risk-taking, deep conceptual understanding, and growth mindset are the norm.

Catalyzing Change

Our District strategic goals lay the foundation for teaching and learning from a productive stance.

Catalyzing Change in Early Childhood and Elementary School Mathematics: Initiating Critical Conversations pushes us to consider equitable mathematics practices and move from deficit to productive beliefs (NCTM, 2020). Our goal is to have each student see themselves as doers, knowers, and sense makers of mathematics. Leveraging *Catalyzing Change*, we have three focused areas to understand our work to help each and every student develop a positive math identity and have agency within their learning.

The three areas of focus in our math learning continue to be:

1. *Build a mathematics community* through routines & structures (experience wonder, joy, and beauty in mathematics, while building agency through making conjectures, justifying thinking, and building on one another's ideas)
2. *Deepen mathematical understanding* to develop confident and capable learners through grade level appropriate goals.
3. *Develop strong foundational skills* emphasizing reasoning and sense making to ensure the highest-quality mathematics education for each and every child.

Math Workshop

Math workshop is a model of instruction that allows all students to be engaged in mathematics learning, provide space for reflection, and for all students to realize their abilities as mathematicians. Math workshop model provides the structures for student choice, problem solving, targeted small group instruction, time throughout the year to practice the critical concepts of the grade level (Lempp, 2017).

For students, our classrooms need to be places where they are comfortable taking intellectual risks. In *From Reading to Math*, Sienna (2009) outlines four values to support students in taking risks and creating discourse. The values are:

- Value the thinking process as well as correct answers.
- Value problems for which more than one answer is possible.
- Value inquisitive responses.
- Value tolerance for mistakes. (Sienna, 2009, p. 68).

Math workshop allows for these values to come through creating a supportive, collaborative learning environment for each and every student.

Number Sense Routines

We define a number sense routine as “an engaging, accessible, purposeful routine to begin your math class that promotes a community of positive mathematics and discussion” (Lempp, 2017, pg.146). It is usually done in the first 5-10 minutes of a math class. Number sense routines are the foundation of supporting social-emotional learning in mathematics. These routines invite all learners into the community while building positive math identity and sense making. It is where students begin to see themselves as doers, knowers, and sense-makers of mathematics.

Fluency

Fluency is the ability to apply procedures efficiently, flexibly, and accurately. Fluency is multifaceted and encompasses basic fact fluency, computational fluency and procedural fluency (Bay-Williams & SanGiovanni, 2021, p. 2). Bay-Williams and SanGiovanni (2021) define efficiency, flexibility, and accuracy as:

Efficiency: Solving a procedure in a reasonable amount of time by selecting an appropriate strategy and readily implementing that strategy

Flexibility: Knowing multiple procedures and applying or adapting strategies to solve procedural problems (Baroody & Dowker, 2003; Star, 2005 as cited by Bay-Williams & SanGiovanni, 2021, p.3).

Accuracy: Correctly solving a procedure. (Bay-Williams & SanGiovanni, 2021, p. 3)

Additionally, Jennifer Bay-Williams and John SanGiovanni state, “Because effective instruction of (real) fluency values actions such as selecting, understanding, and evaluating strategies, as well as flexibility and reasonableness, students are able to develop strategic competence and adaptive reasoning. *These competencies positively shape their mathematics identity, while also nurturing their mathematical agency*” (NCTM, Figuring Out Fluency Presentation, New Orleans, 2022).

Grade 4 Big Ideas & Standards

In fourth grade, instructional time should focus on: (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 (NJDOE, NJSL-M, 2016).

A complete copy of the 2016 New Jersey Student Learning Standards for Grade4 Mathematics may be found on the [NJDOE’s New Jersey Student Learning Standards for Mathematics webpage](#).

Unit 1: Multiplicative Thinking

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

Unit 1 helps us establish our rich learning communities so that students can see themselves as doers, knowers, and sense-makers of math by exploring the question: “How can we understand & apply multiplication and division concepts effectively?” Students use tools like open number lines, arrays, and ratio tables. They will have opportunities to discuss their ideas with others. They use a method called the area model to explore factors, multiples, and different types of numbers. Students also work with equations that involve multiplication and division. The unit ends with the concept of multiplicative comparison as it applies to the world of measurement.

Recommended Pacing

Approximately 20 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.OA.A Use the four operations with whole numbers to solve problems.

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

Standard: 4.OA.B Gain familiarity with factors and multiples.

CPI #	Cumulative Progress Indicator (CPI)
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.

Standard: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

CPI #	Cumulative Progress Indicator (CPI)
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.
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.

Standard: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

CPI #	Cumulative Progress Indicator (CPI)
4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; 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.

4.MD.A.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.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation:	
Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving:	
The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy:	
Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)

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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
Science: Engineering Design	
CPI #	Cumulative Progress Indicator (CPI)
3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
Social Studies	
Standard: 6.1 U.S. History: America in the World: Civics, Government, and Human Rights: Processes and Rules Rules, laws, and policies are designed to protect the rights of people, help resolve conflicts, and promote the common good.	
CPI #	Cumulative Progress Indicator (CPI)
6.1.5.CivicsPR.3	Evaluate school and community rules, laws and/or policies and determine if they meet their intended purpose.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> ● Multiplication and division are inverse operations. ● There are three different structures for multiplication and division problems: area/arrays, equal groups, and comparison, and the unknown quantity in multiplication and division situations is represented in three ways: unknown products, group size unknown, and number of groups unknown. ● A whole number is a multiple of each of its factors. ● Analyzing patterns increases mathematical understanding of whole numbers. ● Patterns are generated by following a specific rule. ● Measurement units can be converted within a single system of measurement. ● Use the four operations aids in solving word problems involving measurement. ● When converting measurements within one system, the size, length, mass, volume, of the object remains the same. 	
Unit Essential Questions	
<ul style="list-style-type: none"> ● How are multiplication and division related and what are different models for them? ● How do the four operations' relationships help to solve problems? ● What is the relationship between factors and multiples? ● How can I determine whether a whole number between 1 and 100 is prime or composite? ● What is a multiplicative comparison? ● What are the customary and metric units for measuring length, capacity, and weight/mass, and how are they related? 	
Objectives	
We are learning to/that:	
<ul style="list-style-type: none"> ● 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. ● Determine whether a given whole number in the range 1-100 is prime or composite. ● 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. 	

- Use mathematical language to justify reasoning.

Evidence of Learning

Assessment

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

Formative Assessment

Summative Assessment

Alternative Assessment

Benchmark

Resources

Foundational Text:

Bridges in Mathematics Grade 4 by The Math Learning Center

Instructional & Professional Resources:

- Exemplars, *Problem Solving for the 21st Century*
- K-5 Math Teaching Resources
- DreamBox Learning (Digital Tool)
- *Math in Practice: Teaching Fourth Grade Math* by Kay B. Sammons, Susan O'Connell, & John SanGiovanni
- *Math Workshop: Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More* by Jennifer Lempp
- *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching* by Jo Boaler
- *Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 4* by Jo Boaler, Jen Munson, & Cathy Williams
- *Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)* by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams

Additional Supports

[WW-P Accommodations and Assessment](#) (Reference Tool and Glossary)

Unit 2: Multi-Digit Multiplication and Early Division

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

In this unit, students continue to develop their understanding of multiplication and division by exploring patterns in numbers and solving multiplication problems with one or two digits. They transition from concrete models to pictorial models, all with an eye on building toward efficiency. They also work with ratio tables to understand the effects of multiplying by 10, 100, and 1,000. Finally, students take on division problems that involve dealing with remainders in different situations.

Recommended Pacing

Approximately 20 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.NBT.A Generalize place value understanding for multi-digit whole numbers.

CPI #	Cumulative Progress Indicator (CPI)
4.NBT.A.1	Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that $700 \div 70 = 10$ by applying concepts of place value and division.

Standard: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

CPI #	Cumulative Progress Indicator (CPI)
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.
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.

Standard: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

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

Standard: 4.OA.A Use the four operations with whole numbers to solve problems.

CPI #	Cumulative Progress Indicator (CPI)
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4.OA.A.3	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Standard: 4.OA.B Gain familiarity with factors and multiples	
CPI #	Cumulative Progress Indicator (CPI)
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.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation: Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one’s thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving: The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy: Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.

Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.

CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

Interdisciplinary Standards

English Language Arts

CPI #	Cumulative Progress Indicator (CPI)
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.
W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Instructional Focus

Unit Enduring Understandings

- As digits progress from right to left, their individual value increases ten times.
- Place value is based on groups of ten and the value of a number is determined by the place of its digits.
- Make generalizations about what happens when a number is multiplied by 10, 100, or 1,000.
- Place value and the properties of operations can be used to solve single- and double-digit multiplication combinations.
- The relative sizes of centimeters, decimeters, and meters can be identified by using models.
- Area is a real-life application of multiplication and division.
- A rectangular array can be used to explain strategies for multiplying with multi-digit numbers.

Unit Essential Questions

- What do effective problem solvers do, and what do they do when they get stuck?
- How does the value of a digit change within a number?
- In what ways can numbers be composed and decomposed? How do you find the prime factors and multiples of a number?
- How can I use the area model to explain multiplication? How can I use what I know about repeated subtraction, equal sharing, and forming equal groups to solve division problems? How does my knowledge of multiplication facts help me to solve problems?

Objectives

We are learning to/that:

- Compare multi-digit numbers based on meanings of the digits in each place, using $=$ symbols to record results of the comparison.
- Know relative sizes of measurement units within one system of units including km, m, cm.
- Multiply 2-digit numbers by 1- and 2-digit numbers, as well as 3-digit numbers by 1-digit numbers.
- Multiply any number by 10 or 100.
- Write and solve story problems involving multiplication of up to 2-digit by 2-digit numbers.
- Take measurements in centimeters.
- Use strategies to master basic multiplication and division facts.

Evidence of Learning

Assessment

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

Formative Assessment

Summative Assessment

Alternative Assessment

Benchmark

Resources

Foundational Text:

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Instructional & Professional Resources:

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Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

Unit 3: Fractions and Decimals	
Content Area: Elementary Mathematics	
Course & Grade Level: Mathematics, Grade 4	
Summary and Rationale	
In this unit, students will use a variety of tools to understand and work with fractions and decimals. They learn to model, read, write, compare, order, compose, and break down fractions and decimals. Additionally, they apply their knowledge to practical, everyday situations. The unit provides a hands-on and real-world approach to learning about fractions and decimals.	
Recommended Pacing	
Approximately 25 days	
New Jersey Student Learning Standards for Mathematics	
Standard: 4.NF.A Extend understanding of fraction equivalence and ordering.	
CPI #	Cumulative Progress Indicator (CPI)
4.NF.A.1	Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NF.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.
Standard: 4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	
CPI #	Cumulative Progress Indicator (CPI)
4.NF.B.3	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples: $3/8 = 1/8 + 1/8 + 1/8$; $3/8 = 1/8 + 2/8$; $2\ 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$. c. Add and subtract mixed numbers with Like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
4.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of $1/b$. For example, use a visual fraction model to represent $5/4$ as the product $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$. b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a)/b$.)
Standard: 4.NF.C Understand decimal notation for fractions, and compare decimal fractions.	
CPI #	Cumulative Progress Indicator (CPI)

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 100.4 For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.
4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.
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.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation: Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving: The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy: Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)

8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)
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.
RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> ● Comparisons are only valid when the two fractions or decimals refer to the same whole. ● Fractions and mixed numbers are composed of unit fractions and can be decomposed as a sum of unit fractions. ● Fractions greater than one and mixed numbers express the same value. ● Addition and subtraction of fractions involves joining and separating parts referring to the same whole ● Decimal notation is another way to represent a fraction. ● Fractions with denominators of 10 can be expressed as an equivalent fraction with a denominator of 100 or when using decimal notation. 	
Unit Essential Questions	
<ul style="list-style-type: none"> ● What do effective problem solvers do, and what do they do when they get stuck? ● How does finding equivalent fractions help you compare? ● Why is it important to identify, label, and compare fractions as representations of equal parts of a whole or of a set? ● Why does the numerator change, but the denominator stays the same when adding and subtracting fractions with like denominators? ● How can fractions and mixed numbers be added and subtracted on a number line? ● How/why does the whole number become smaller when you multiply a whole number by a fraction? ● How can multiplying a whole number by a fraction be displayed as repeated addition (as a multiple of a unit fraction)? ● How can a fraction be represented by a decimal? 	
Objectives	
We are learning to/that:	
<ul style="list-style-type: none"> ● Explain and compare using mathematical language how two fractions, e.g., $\frac{2}{8}$ and $\frac{4}{16}$ are equivalent fractions through the use of a visual model or through multiplying by 1 whole (which can be represented whenever the numerator and denominator are the same). Show $\frac{2}{8} \times \frac{2}{2} = \frac{4}{16}$ or $\frac{2}{8} \times \frac{3}{3} = \frac{6}{24}$. ● Decompose a fraction into a sum of fractions with the same denominator in more than one way, such as an equation or a fraction model. Example: $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$ or $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$ ● Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. ● Compare two decimals to hundredths by reasoning by their size by recording the comparisons with the symbols $>$, $<$, $=$, and justify conclusions using a visual model with mathematical language. ● Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions (For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.) 	

<ul style="list-style-type: none"> ● Use decimal notation for fractions with denominators 10 to 100. (For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.)
Evidence of Learning
Assessment
<p>Assessment plan may include teacher-designed formative and summative assessments and district common assessments. During each common, formative, and summative assessment, teachers will provide alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.</p>
<input checked="" type="checkbox"/> Formative Assessment
<input checked="" type="checkbox"/> Summative Assessment
<input checked="" type="checkbox"/> Alternative Assessment
<input checked="" type="checkbox"/> Benchmark Assessment
Resources
<p>Core Text:</p> <p>Foundational Text: <i>Bridges in Mathematics Grade 4</i> by The Math Learning Center</p> <p>Instructional & Professional Resources:</p> <ul style="list-style-type: none"> ● Exemplars, <i>Problem Solving for the 21st Century</i> ● K-5 Math Teaching Resources ● DreamBox Learning (Digital Tool) ● <i>Math in Practice: Teaching Second Grade Math</i> by Cheryl Akers, Susan O'Connell, & John SanGiovanni ● <i>Math Workshop: Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More</i> by Jennifer Lempp ● <i>Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching</i> by Jo Boaler ● <i>Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 3</i> by Jo Boaler, Jen Munson, & Cathy Williams ● <i>Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)</i> by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams
Additional Supports
<u>WW-P Accommodations and Assessment</u> (Reference Tool and Glossary)

Unit 4: Addition, Subtraction, and Measurement	
Content Area: Elementary Mathematics	
Course & Grade Level: Mathematics, Grade 4	
Summary and Rationale	
The fourth unit revisits addition, subtraction, and measurement concepts as students delve into the standard (or traditional) algorithms for addition and subtraction and compare them with alternative methods to determine their effectiveness. Students will then move into exploring various measurement aspects as they also investigate the connections between different units of measurement. The unit ends with students working with problems that involve converting units within the same measurement system.	
Recommended Pacing	
Approximately 20 days	
New Jersey Student Learning Standards for Mathematics	
Standard: 4.NBT.A Generalize place value understanding for multi-digit whole numbers.	
CPI #	Cumulative Progress Indicator (CPI)
4.NBT.A.1	Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right
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
4.NBT.A.3	Use place value understanding to round multi-digit whole numbers to any place.
Standard: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.	
CPI #	Cumulative Progress Indicator (CPI)
4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
Standard: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	
CPI #	Cumulative Progress Indicator (CPI)
4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; 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
4.MD.A.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.
Standard 4.MD.B Represent and interpret data.	
4.MD.B.4	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 line plots.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation:	
Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	

CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving: The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy: Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)
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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
Science: Engineering Design	
CPI #	Cumulative Progress Indicator (CPI)
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> ● As digits progress from right to left, their individual value increases ten times. ● A number can be written using its name, standard, or expanded form. ● Rounding numbers can be used when estimating answers to real-world problems. ● The standard algorithm for addition and subtraction relies on adding or subtracting like base-ten units. ● Measurement units can be converted within a single system of measurement. ● When converting measurements within one system, the size, length, mass, volume, of the object remains the same. ● Converting from larger to smaller units of measurement in the metric system is done by multiplying by powers of ten. ● Data sets can be organized in a variety of ways, including line plots. 	
Unit Essential Questions	
<ul style="list-style-type: none"> ● What are the mathematical attributes of objects or processes and how are they measured or calculated ● What do effective problem solvers do, and what do they do when they get stuck? ● How does the value of a digit change within a number? ● How can place value understanding help us with comparing, ordering, and rounding whole numbers? ● In what ways can numbers be composed and decomposed? ● How can my understanding of place value explain the process of addition and subtraction? 	

- What are the standard procedures for adding and subtracting numbers?
- How can you estimate, measure, and change customary units of length, volume, and mass?
- Why does the size, length, mass, volume of an object remain the same when converted to another unit of measurement?
- What are the customary units for measuring length, capacity, and weight/mass, and how are they related?
- How can line plots and other tools help to solve measurement problems?

Objectives

We are learning to/that:

- Compare multi-digit numbers based on meanings of the digits in each place, using $=$ symbols to record results of the comparison.
- Round whole numbers up to 1,000,000 to the nearest ten, hundred, thousand, ten thousand, hundred thousand, million using place value understanding.
- Add and subtract multi-digit whole numbers using the standard algorithm fluently.
- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb., oz.; l, ml; h, min, sec.
- Express (convert) measurements in a larger unit in terms of a smaller unit within a single system of measurements.
- 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 (e.g., milliliters to liters, grams to kilograms, meters to centimeters).
- Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$).

Evidence of Learning

Assessment

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

Formative Assessment

Summative Assessment

Alternative Assessment

Benchmark Assessment

Resources

Foundational Text:

Bridges in Mathematics Grade 4 by The Math Learning Center

Instructional & Professional Resources:

- Exemplars, *Problem Solving for the 21st Century*
- K-5 Math Teaching Resources
- DreamBox Learning (Digital Tool)
- *Math in Practice: Teaching Fourth Grade Math* by Kay B. Sammons, Susan O'Connell, & John SanGiovanni
- *Math Workshop: Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More* by Jennifer Lempp
- *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching* by Jo Boaler
- *Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 4* by Jo Boaler, Jen Munson, & Cathy Williams
- *Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)* by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams

Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

Unit 5: Geometry and Measurement

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

In this unit, students are formally introduced to several new geometric concepts, including angles and their measurement, parallel and perpendicular lines, and reflective symmetry. They use vocabulary terms and geometric concepts to sort and classify various polygons. Students will delve into measuring the area and perimeter of rectangles, leading to generalizations that introduce the formulas for both. The unit ends with a return to angle measurement, emphasizing that angles involve rotations around a fixed point and can be combined or added together.

Recommended Pacing

Approximately 20 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.OA.C Generate and analyze patterns.

CPI #	Cumulative Progress Indicator (CPI)
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

Standard: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

CPI #	Cumulative Progress Indicator (CPI)
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.

Standard: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

CPI #	Cumulative Progress Indicator (CPI)
4.MD.A.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

Standard: 4.MD.C Geometric measurement: understand concepts of angle and measure angles.

CPI #	Cumulative Progress Indicator (CPI)
4.MD.C.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $\frac{1}{360}$ of a circle is called a "one degree angle," and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
4.MD.C.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
4.MD.C.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.

Standard: 4.G.A Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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

Standard: Standards for Mathematical Practice

CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.

New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation:**

Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.

CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).

Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving:

The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.

CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.

Standard 9.4 Life Literacies and Key Skills: Technology Literacy:

Collaborating digitally as a team can often develop a better artifact than an individual working alone.

CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).

New Jersey Student Learning Standards for Computer Science and Design Thinking

Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.

CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.

Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.

CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

Interdisciplinary Standards

English Language Arts

CPI #	Cumulative Progress Indicator (CPI)
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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Instructional Focus

Unit Enduring Understandings

- Lines, rays, and angles are used to identify two-dimensional figures.
- Two-dimensional figures are classified based on type of lines (parallel/perpendicular) and size of angles.
- Angles can be measured and these measurements are additive.
- Angles are measured in the context of a central angle of a circle.
- Angles are composed of smaller angles.
- A line of symmetry for a two-dimensional figure can be found by folding the shape into two congruent parts.

Unit Essential Questions

- How is mathematics used to measure, model, and calculate change?
- What do effective problem solvers do, and what do they do when they are stuck?
- How are parallel and perpendicular lines used in classifying two-dimensional shapes?
- How can lines, angles, and shapes be described, analyzed, and classified?
- How can angles be composed or decomposed to form larger or smaller angles?
- How are angles applied to the context of a circle?
- How are protractors used to measure and aid in drawing angles and triangles?
- How can an addition or subtraction equation be used to solve a missing angle measure when the whole angle has been divided into two angles and only one measurement is given?
- Why do some shapes have more than one line of symmetry?

Objectives

We are learning to/that:

- Construct and classify points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular/parallel lines in two-dimensional figures.
- Classify two-dimensional figures based on the absence or presence of their parallel or perpendicular lines.
- Measure angles in whole-number degrees using a protractor and sketch angles of a specific measure, realizing that a circle contains 360 1- degree angles and that all angles are measured with reference to a circle.
- Understand the angle measure of the whole is the sum of the angle measures of the parts and 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.
- Identify line-symmetric figures and draw lines of symmetry.

Evidence of Learning

Assessment

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

Formative Assessment

Summative Assessment

Alternative Assessment

Benchmark Assessment

Resources**Foundational Text:**

Bridges in Mathematics Grade 4 by The Math Learning Center

Instructional & Professional Resources:

- Exemplars, *Problem Solving for the 21st Century*
- K-5 Math Teaching Resources
- DreamBox Learning (Digital Tool)
- *Math in Practice: Teaching Fourth Grade Math* by Kay B. Sammons, Susan O'Connell, & John SanGiovanni
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- *Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)* by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams

Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

Unit 6: Multiplication and Division, Data and Fractions

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

Unit 6 brings back and builds upon the ideas explored in Unit 2. The instruction in this unit aims to foster a deeper understanding of the connections between multiplication and division. Each module offers diverse opportunities for students to model, solve problems, share strategies, play games, and apply skills in various situations. Context is key as students continue to work on interpreting remainders.

Recommended Pacing

Approximately 25 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.OA.A Use the four operations with whole numbers to solve problems.

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

Standard: 4.OA.B. Gain familiarity with factors and multiples.

CPI #	Cumulative Progress Indicator (CPI)
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.

Standard: 4.OA.C. Generate and analyze patterns.

CPI #	Cumulative Progress Indicator (CPI)
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.

Standard: 4.NBT.B. Use place value understanding and properties of operations to perform multi-digit arithmetic.

CPI #	Cumulative Progress Indicator (CPI)
4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
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.
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.

Standard: 4.NF.A Extend understanding of fraction equivalence and ordering.

CPI #	Cumulative Progress Indicator (CPI)
4.NF.A.1	Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{n \times a}{n \times b}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NF.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 $\frac{1}{2}$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or

Standard: 4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	
CPI #	Cumulative Progress Indicator (CPI)
4.NF.B.3d	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
4.NF.B.4b	Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number.
4.NF.B.4c	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.
4.NF.C.6	Use decimal notation for fractions with denominators 10 or 100.
Standard 4.MD.A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	
CPI #	Cumulative Progress Indicator (CPI)
4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; 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.
4.MD.A.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.
4.MD.A.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
Standard: 4.MD.B Represent and interpret data	
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.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation:	
Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving:	

The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy: Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)
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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> ● Metric units are based on factors of 10 and 100. ● A set of data can be analyzed by using mean, median, mode, and range. ● Fraction sets can be represented as line plots which can then be used to solve problems involving addition and subtraction of fractions. ● Multi-digit by one or two digit multiplication problems can be solved using place value, rectangular arrays, properties of operations. ● Multi-digit by one digit division problems can be solved using place value, rectangular arrays, properties of operations and multiplicative comparison. ● Rounding and estimation strategies aid in the assessment of answer reasonableness when applied to multi-step problems. ● Division can be utilized to find the area and perimeter in problems where some dimensions are unknown. 	
Unit Essential Questions	
<ul style="list-style-type: none"> ● What are the patterns in the information we collect and how are they useful? ● How can mathematics be used to provide models that help us interpret data and make predictions? ● In what ways can data be expressed so that its accurate meaning is concisely presented to a specific audience? 	

- How do graphs of mathematical models and data help us better understand the world in which we live?
- What do effective problem solvers do, and what do they do when they get stuck?
- How are metric units related?
- What strategies can be used to analyze a set of data?
- How can I multiply a multi-digit multiplicand by a 1 or 2 digit multiplier?
- How can I divide a multi-digit dividend by a 1 digit divisor?
- How can I find the area and perimeter of a rectangle when some dimensions are unknown?
- How can I determine if my answer is reasonable when solving multi-step problems?
- How are line plots used to collect and represent sets of fractions?

Objectives

We are learning to/that:

- Utilize place value, rectangular arrays, and properties of operations to multiply and divide multi-digit whole numbers by one digit whole numbers
- Multiply two 2-digit numbers using strategies based on place value and properties of operations.
- Solve division story problems with remainders.
- Solve story problems involving a multiplicative comparison using division.
- Assess the reasonableness of answers to multi-step problems using rounding and other estimation strategies.
- Identify relative sizes of centimeters, meters, and kilometers.
- Apply area and perimeter formulas to solve a problem with unknown dimensions.
- Add and subtract mixed numbers with like denominators.
- Make a line plot to represent a data set comprising measurements taken in halves, fourths, and eighths of a unit.
- Solve problems involving addition and subtraction of fractions shown on a line plot.
- Determine mean, median, mode, and range of a set of data comprising fractional numbers.
- Write fractions with denominator 10 in decimal notation.

Evidence of Learning

Assessment

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

- Formative Assessment
- Summative Assessment
- Alternative Assessment
- Benchmark Assessment

Resources

Foundational Text:

Bridges in Mathematics Grade 4 by The Math Learning Center

Instructional & Professional Resources:

- Exemplars, *Problem Solving for the 21st Century*
- K-5 Math Teaching Resources
- DreamBox Learning (Digital Tool)
- *Math in Practice: Teaching Fourth Grade Math* by Kay B. Sammons, Susan O'Connell, & John SanGiovanni
- *Math Workshop: Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More* by Jennifer Lempp

- *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching* by Jo Boaler
- *Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 4* by Jo Boaler, Jen Munson, & Cathy Williams
- *Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)* by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams

Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

Unit 7: Extending Fractions, Decimals, and Multi-Digit Multiplication

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

Unit 7 focuses on reinforcing and building upon students' fractional understanding—a major focus in grade 4. Students will explore equivalence and compare fractions with different denominators. In the later part of the unit, students revisit and review the strategies they have learned for multiplication with particular attention to four-part and two-part arrays and partial products, as well as a taste of the standard algorithm for multiplication in preparation for next year.

Recommended Pacing

Approximately 20 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.OA.A Use the four operations with whole numbers to solve problems.

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

Standard: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

CPI #	Cumulative Progress Indicator (CPI)
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.
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.

Standard: 4.NF.A Extend understanding of fraction equivalence and ordering.

CPI #	Cumulative Progress Indicator (CPI)
4.NF.A.1	Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NF.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.

Standard: 4.NF.C Understand decimal notation for fractions, and compare decimal fractions.

CPI #	Cumulative Progress Indicator (CPI)
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. For example, express $3/10$ as $30/100$, and add $3/10 + 4/100 = 34/100$.
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.

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.
Standard: Standards for Mathematical Practice	
CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.
4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation:	
Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.1	Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving:	
The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy:	
Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)

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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Instructional Focus

Unit Enduring Understandings

- Use comparing, ordering, and equivalent fractions to extend understanding of fractions.
- Fractions can be represented visually and in written form.
- Comparisons are only valid when the two fractions refer to the same whole.
- Fractions and mixed numbers are composed of unit fractions and can be decomposed as a sum of unit fractions.
- Fractions greater than one and mixed numbers express the same value.
- Using students' previous knowledge of the properties of whole numbers in addition and subtraction will aid in teaching addition and subtractions of fractions.
- Fractions greater than one and mixed numbers express the same value.
- Addition and subtraction of fractions involves joining and separating parts referring to the same whole.
- Decimal notation is another way to represent a fraction.
- Fractions with denominators of 10 can be expressed as an equivalent fraction with a denominator of 100.
- Fractions with denominators of 10 and 100 may be expressed when using decimal notation.
- When comparing two decimals to hundredths, the comparisons are only valid if they refer to the same whole.
- Place value understanding and properties of operations are necessary to solve multi-digit arithmetic.
- Understanding place value and properties of operations is necessary to perform multi-digit multiplication.
- There are three different structures for multiplication and division problems: area/arrays, equal groups, and comparison, and the unknown quantity in multiplication and division situations is represented in three ways: unknown products, group size unknown, and number of groups unknown.

Unit Essential Questions

- How does finding equivalent fractions help you compare?
- What do effective problem solvers do, and what do they do when they get stuck?
- How are fractions used in problem-solving situations?
- How are fractions composed, decomposed, compared and represented?
- Why is it important to identify, label, and compare fractions as representations of equal parts of a whole or of a set?
- How can the same fractional amount be named in different ways using symbols?
- How can fractions be compared and ordered?
- How can a fraction be represented by a decimal?
- How can visual models be used to help with understanding decimals?
- How can visual models be used to determine and compare equivalent fractions and decimals?
- How would you compare and order decimals through hundredths?
- How is decimal numeration related to whole number numeration?
- What is a standard procedure for multiplying multi-digit numbers, and how do place value properties aid computation?
- What real-life situations require the use of multiplication?
- What are the different models for multiplication (arrays/area models)?

Objectives

We are learning to/that:

- Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions (For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.)
- Use decimal notation for fractions with denominators 10 to 1 (For example, rewrite 0.62 as $\frac{62}{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.)
- Compare two decimals to hundredths by reasoning by their size by recording the comparisons with the symbols $>$, $<$, $=$, and justify conclusions using a visual model with mathematical language.
- Multiply two 2-digit numbers using strategies based on place value and properties of operations.
- Illustrate and use mathematical language to explain the calculations using equations, rectangular array and area models.

Evidence of Learning**Assessment**

The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide [accommodations](#) and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.

 Formative Assessment Summative Assessment Alternative Assessment Benchmark Assessment**Resources****Foundational Text:**

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Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

Unit 8: Playground Design

Content Area: Elementary Mathematics

Course & Grade Level: Mathematics, Grade 4

Summary and Rationale

In this final unit, students engage in a hands-on project where they design and construct scaled model playgrounds featuring simple machines. They use their multiplication and division strategies to map an outdoor space onto paper. To determine which playground items are most essential, they conduct a survey within the school community, and they then organize, display, and analyze the data using graphs before presenting the data. Students use what they know about measurement to create a scaled map of their designs and build 3-D scaled models.

Recommended Pacing

Approximately 15 days

New Jersey Student Learning Standards for Mathematics

Standard: 4.MD.A Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

CPI #	Cumulative Progress Indicator (CPI)
4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, mm; 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.
4.MD.A.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.
4.MD.A.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Standard: 4.MD.C Geometric measurement: understand concepts of angle and measure angles.

CPI #	Cumulative Progress Indicator (CPI)
4.MD.C.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $1/360$ of a circle is called a "one degree angle," and can be used to measure angles. b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.
4.MD.C.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
4.MD.C.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.

Standard: 4.G.A Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

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

Standard: Standards for Mathematical Practice

CPI #	Cumulative Progress Indicator (CPI)
4.MP.1	Make sense of problems and persevere in solving them.
4.MP.2	Reason abstractly and quantitatively.
4.MP.3	Construct viable arguments and critique the reasoning of others.
4.MP.4	Model with mathematics.

4.MP.5	Use appropriate tools strategically.
4.MP.6	Attend to precision.
4.MP.7	Look for and make use of structure.
4.MP.8	Look for and express regularity in repeated reasoning.
New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills	
Standard: 9.4 Life Literacies and Key Skills: Creativity and Innovation: Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
Standard: 9.4 Life Literacies and Key Skills: Critical Thinking and Problem-solving: The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.
Standard 9.4 Life Literacies and Key Skills: Technology Literacy: Collaborating digitally as a team can often develop a better artifact than an individual working alone.	
CPI #	Cumulative Progress Indicator (CPI)
9.4.5.TL.4	Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
New Jersey Student Learning Standards for Computer Science and Design Thinking	
Standard: 8.1 Computer Science: Data & Analysis: Data can be organized, displayed, and presented to highlight relationships.	
CPI #	Cumulative Progress Indicator (CPI)
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
Standard: 8.2 Design Thinking: Engineering Design: Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.	
CPI #	Cumulative Progress Indicator (CPI)
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
Interdisciplinary Standards	
English Language Arts	
CPI #	Cumulative Progress Indicator (CPI)
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.
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
Science: Engineering Design	
3-5-ETS1-11	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved
Instructional Focus	
Unit Enduring Understandings	
<ul style="list-style-type: none"> ● Division can be utilized to find the area and perimeter in problems where some dimensions are unknown. ● Measurement can be used to find, compare, and extrapolate dimensions. ● A set of data can be analyzed by using mean, median, mode, and range. ● A set of data can be analyzed by using graphs, line plots, and tables. ● Computer software can create models to facilitate analysis and communication of data in real-world applications. ● Geometry facilitates precision in the creation, understanding, and communication of a design or model. 	
Unit Essential Questions	
<ul style="list-style-type: none"> ● What do effective problem solvers do, and what do they do when they get stuck? ● In what ways can data be expressed so that its accurate meaning is concisely presented to a specific audience? ● How are spatial relationships, including shape and dimension, used to draw, construct, model and represent real situations or solve problems? ● What are the mathematical attributes of objects or processes and how are they measured? ● How can I apply my knowledge of measurement in a real-world application? ● How can I communicate my knowledge of data in a real-world application? ● When presented with a design challenge, how do I use geometry to develop, create, and explain my design or model? 	
Objectives	
<p>We are learning to/that:</p> <ul style="list-style-type: none"> ● Express measurements in a larger unit in terms of a smaller unit. ● Record measurement equivalents in a two-column table. ● 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. ● Apply the area and perimeter formulas for rectangles in real world and mathematical problems. ● Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: ● Measure angles in whole-number degrees using a protractor and sketch angles of specified measure. ● Recognize angle measure as additive. ● Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. ● Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. 	
Assessment	
<p>The assessment plan may include teacher-designed formative and summative assessments, district common assessments, self-assessments, and analysis of standardized benchmark and interim assessment data. During each common, formative, and summative assessment, teachers will provide accommodations and alternative assessment opportunities that adhere to 504 and IEP requirements. Alternative Assessments are individualized for the needs of all students. Throughout the unit, students will be engaged in activities that involve finding patterns, making generalizations, drawing conclusions, and communicating their ideas with others. Teachers will have many opportunities to observe students' growth in these areas, as well as with specific math skills and concepts throughout this unit.</p>	
<input checked="" type="checkbox"/> Formative Assessment	

Summative Assessment

Alternative Assessment

Benchmark Assessment

Resources

Foundational Text:

Bridges in Mathematics Grade 4 by The Math Learning Center

Instructional & Professional Resources:

- Exemplars, *Problem Solving for the 21st Century*
- K-5 Math Teaching Resources
- DreamBox Learning (Digital Tool)
- *Math in Practice: Teaching Fourth Grade Math* by Kay B. Sammons, Susan O'Connell, & John SanGiovanni
- *Math Workshop: Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More* by Jennifer Lempp
- *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching* by Jo Boaler
- *Mindset Mathematics: Visualizing and Investigating Big Ideas, Grade 4* by Jo Boaler, Jen Munson, & Cathy Williams
- *Teaching Student Centered Mathematics: Developmentally Appropriate Instruction for Grades 3-5 (Volume II)* by John A. Van de Walle, Karen S. Karp, LouAnn H. Lovin, & Jennifer M. Bay-Williams

Additional Supports

WW-P Accommodations and Assessment (Reference Tool and Glossary)

References

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- Lempp, J. (2017). *Math workshop: Five steps to implementing guided math, learning stations, reflection, and more, grades K-5*. Math Solutions.
- National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. NCTM.
- National Council of Teachers of Mathematics (NCTM). (2020). *Catalyzing change in early childhood and elementary mathematics: Initiating critical conversations*. NCTM.
- New Jersey Department of Education. (2016). New Jersey Student Learning Standards for Mathematics. Retrieved from <https://www.nj.gov/education/standards/math/Index.shtml>
- O'Connell, S. (2016). *Math in practice: A guide for teachers*. Heinemann.
- Sienna, M. (2009). *From Reading to math, grades K-5: How best practices in literacy can make you a better math teacher*. Math Solutions.