Content Area: Mathematics
Standard: 1. Number Sense, Properties, and Operations

Prepared Graduates:

- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations

Grade Level Expectation: Fourth Grade

Concepts and skills students master:

2. Different models and representations can be used to compare fractional parts

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Use ideas of fraction equivalence and ordering to: (CCSS: 4.NF) i. Explain equivalence of fractions using drawings and models.[1] ii. Use the principle of fraction equivalence to recognize and generate equivalent fractions. (CCSS: 4.NF.1) iii. Compare two fractions with different numerators and different denominators,[2] and justify the conclusions.[3] (CCSS: 4.NF.2) b. Build fractions from unit fractions by applying understandings of operations on whole numbers. (CCSS: 4.NF) i. Apply previous understandings of addition and subtraction to add and subtract fractions.[4] 1. Compose and decompose fractions as sums and differences of fractions with the same denominator in more than one way and justify with visual models. 2. Add and subtract mixed numbers with like denominators.[5] (CCSS: 4.NF.3c) 3. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.[6] (CCSS: 4.NF.3d) ii. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. (CCSS: 4.NF.4) 1. Express a fraction *a*/*b* as a multiple of 1/*b*.[7] (CCSS: 4.NF.4a) 2. Use a visual fraction model to express a/b as a multiple of 1/b, and apply to multiplication of whole number by a fraction.[8] (CCSS: 4.NF.4b) 3. Solve word problems involving multiplication of a fraction by a whole number.[9] (CCSS: 4.NF.4c)	**Inquiry Questions:** 1. How can different fractions represent the same quantity? 2. How are fractions used as models? 3. Why are fractions so useful? 4. What would the world be like without fractions? **Relevance and Application:** 1. Fractions and decimals are used any time there is a need to apportion such as sharing food, cooking, making savings plans, creating art projects, timing in music, or portioning supplies. 2. Fractions are used to represent the chance that an event will occur such as randomly selecting a certain color of shirt or the probability of a certain player scoring a soccer goal. 3. Fractions are used to measure quantities between whole units such as number of meters between houses, the height of a student, or the diameter of the moon. **Nature of Mathematics:** 1. Mathematicians explore number properties and relationships because they enjoy discovering beautiful new and unexpected aspects of number systems. They use their knowledge of number systems to create appropriate models for all kinds of real-world systems. 2. Mathematicians construct viable arguments and critique the reasoning of others. (MP) 3. Mathematicians model with mathematics. (MP)

[1] Explain why a fraction *a*/*b* is equivalent to a fraction (*n* × *a*)/(*n* × *b*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. (CCSS: 4.NF.1)
[2] 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 <, (CCSS: 4.NF.2)
[3] e.g., by using a visual fraction model. (CCSS: 4.NF.2)
[4] Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. (CCSS: 4.NF.3)
Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. (CCSS: 4.NF.3a)
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.* (CCSS: 4.NF.3b)
[5] 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. (CCSS: 4.NF.3c)
[6] e.g., by using visual fraction models and equations to represent the problem. (CCSS: 4.NF.3d)
[7] For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4). (CCSS: 4.NF.4a)
[8] For example, 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.) (CCSS: 4.NF.4b)
[9] e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* (CCSS: 4.NF.4c)

Content Area: Mathematics

Standard: 1. Number Sense, Properties, and Operations

Prepared Graduates:

- Are fluent with basic numerical, symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency

Grade Level Expectation: Fourth Grade

Concepts and skills students master:

3. Formulate, represent, and use algorithms to compute with flexibility, accuracy, and efficiency

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Use place value understanding and properties of operations to perform multi-digit arithmetic. (CCSS: 4.NBT) i. Fluently add and subtract multi-digit whole numbers using standard algorithms. (CCSS: 4.NBT.4) ii. 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. (CCSS: 4.NBT.5) iii. 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. (CCSS: 4.NBT.6) iv. Illustrate and explain multiplication and division calculation by using equations, rectangular arrays, and/or area models. (CCSS: 4.NBT.6) b. Use the four operations with whole numbers to solve problems. (CCSS: 4.OA) i. Interpret a multiplication equation as a comparison.[1] (CCSS: 4.OA.1) ii. Represent verbal statements of multiplicative comparisons as multiplication equations. (CCSS: 4.OA.1) iii. Multiply or divide to solve word problems involving multiplicative comparison.[2] (CCSS: 4.OA.2) iv. 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. (CCSS: 4.OA.3) v. Represent multistep word problems with equations using a variable to represent the unknown quantity. (CCSS: 4.OA.3) vi. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (CCSS: 4.OA.3) vii. Using the four operations analyze the relationship between choice and opportunity cost (PFL)	**Inquiry Questions:** 1. Is it possible to make multiplication and division of large numbers easy? 2. What do remainders mean and how are they used? 3. When is the "correct" answer not the most useful answer? **Relevance and Application:** 1. Multiplication is an essential component of mathematics. Knowledge of multiplication is the basis for understanding division, fractions, geometry, and algebra. **Nature of Mathematics:** 1. Mathematicians envision and test strategies for solving problems. 2. Mathematicians develop simple procedures to express complex mathematical concepts. 3. Mathematicians make sense of problems and persevere in solving them. (MP) 4. Mathematicians construct viable arguments and critique the reasoning of others. (MP) 5. Mathematicians look for and express regularity in repeated reasoning. (MP)

[1] e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. (CCSS: 4.OA.1)
[2] e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (CCSS: 4.OA.2)