Grade 4 Unit 3: Building Fraction and Decimal Understanding

Content Area: **Math**
Course(s): **Math Grade 4**
Time Period: **MP3**
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NJSLS Math

4.NF.A.1	Explain why a fraction □/□ is equivalent to a fraction (□ × □)/(□ × □) 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.
4.NF.B.3	Understand a fraction □/□ with □ > 1 as a sum of fractions 1/□.
4.NF.B.3.a	Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
4.NF.B.3.b	Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.
4.NF.B.3.c	Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
4.NF.B.3.d	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
4.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
4.NF.B.4.a	Understand a fraction □/□ as a multiple of 1/□.
4.NF.B.4.b	Understand a multiple of □/□ as a multiple of 1/□, and use this understanding to multiply a fraction by a whole number.
4.NF.B.4.c	Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.
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.NF.C.6	Use decimal notation for fractions with denominators 10 or 100.
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.
4.M.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.M.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.DL.B.5	Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using information presented in line plots.

Unit Focus

- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- Represent and interpret data.
- Understand decimal notation for fractions, and compare decimal fractions.

Standards for Math Practice

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Critical Knowledge & Skills

NJSLS Math	Suggested Math Practices	Critical Knowledge and Skills
4.NF.B.3a-d (**M**) 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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of	Concepts: • Some fractions can be decomposed. • Addition/subtraction of fractions is joining/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.	others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Students will be able to: • Decompose a fraction into a sum of fractions with the same denominator in more than one way. • Write decompositions of fractions as an equation. • Develop visual fraction models that represent decomposed fractions and use them to justify decompositions. • Add and subtract fractions having like denominators in order to solve real world problems. • Develop visual fraction models and write equations to represent real world problems involving addition and subtraction of fractions. • Add and subtract mixed numbers with like denominators. Learning Goal 1: • Decompose a fraction into a sum of fractions with the same denominator in more than one way and record the decomposition as an equation; justify the decomposition with a visual fraction model. Learning Goal 2: • Add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction or improper fraction.

		Learning Goal 3: • Solve word problems involving addition and subtraction of fractions having like denominators using visual fraction models and equations to represent the problem.
4.NF.B.4a-c (**M**) 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 x 1/4, recording the conclusion by the equation 5/4 = 5 x (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 x (2/5) as 6 x 1/5, recognizing this product as 6/5. In general, n x (a/b) = (nxa)/b. c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?	MP.1 Make sense of problems and persevere in solving them. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concepts: • Fraction Multiplication: any fraction a/b as a multiple of fraction 1/b. • Fraction Multiplication: any multiple of fraction a/b is also a multiple of fraction 1/b. Students will be able to: • Represent a/b as 1 x a/b using a visual fraction model. • Represent n x a/b as (nxa)/b in a visual fraction model. • Multiply a fraction by a whole number. • Solve real world problems by multiplying a fraction by a whole number, using visual fraction models and equations to represent the problem. Learning Goal 4: • Multiply a fraction by a whole number using visual fraction models and equations, demonstrating a fraction ab as a multiple of 1/b. Learning Goal 5:

		• Multiply a fraction by a whole number, using a visual fraction model and equations to demonstrate that a multiple of a/b is the product of 1/b and a whole number. Learning Goal 6: • Solve 1-step word problems involving multiplication of a fraction by a whole number, using visual fraction models and equations to represent the problem.
4.M.A.2 (**S**) 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. Climate Change Example: Students may, knowing that energy and fuels are derived from natural resources and that their uses affect the climate, use the four operations to solve word problems related to the use of natural resources and involving distance, time, liquid volume, and/or the mass of objects.	MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concepts: • No new concepts introduced Students will be able to: • Solve word problems (using addition, subtraction and multiplication) involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals. • Solve word problems (using all four operations) involving whole number distances, intervals of time, liquid volumes, masses of objects, and money, including problems requiring expressing measurements given in a larger measurement unit in terms of a smaller measurement unit (conversion). • Construct diagrams (e.g.

		number line diagrams) to represent measurement quantities. Learning Goal 7: • Solve word problems involving simple fractions or decimals that incorporate measurement comparisons of like units (including problems that require measurements given in a larger unit in terms of a smaller unit).
4.M.A.1 (**S**) 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), ...	MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concepts: • Relative sizes of measurements (e.g. a kilometer is 1000 times as long as a meter and 100,000 times as long as a centimeter). Students will be able to: • Express measurements of a larger unit in terms of a smaller unit (within a single measurement system) (e.g. convert hours to minutes, kilometers to centimeters, etc). • Generate a two-column table to record measurement equivalents. Learning Goal 8: • Express measurement in a larger unit in terms of a smaller unit and record equivalent measures in a two-column table.
4.DL.B.5 (**S**) 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	MP.4 Model with mathematics.	Concepts: • No new concepts

and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.  Climate Change Example: Students may, knowing that energy and fuels are derived from natural resources and that their uses affect the climate, make a line plot to display a data set of measurements in fractions of a unit.	MP.5 Use appropriate tools strategically.	introduced Students will be able to: • Given a data set consisting of measurements in fractions of a unit, create a line plot. • Using measurement information presented in line plots, add and subtract fractions with like denominators in order to solve problems. Learning Goal 9: • Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8) and use it to solve problems involving addition and subtraction of fractions with like denominators.
4.NF.A.1 (**M**) Explain why a fraction a/b is equivalent to a fraction (nxa)/(nxb) 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.	MP.1 Make sense of problems and persevere in solving them. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concepts: • Equivalent fractions are the same size while the number and size of the parts differ. Students will be able to: • Explain, using visual fraction models, why two fractions are equivalent. • Generate equivalent fractions, using fraction a/b as equivalent to fraction nxa/nxb. Learning Goal 10: • Recognize and generate equivalent fractions and explain why they are equivalent using visual

		fraction models.
4.NF.A.2 (**M**) 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.	MP.1 Make sense of problems and persevere in solving them. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concepts: • Fractions may only be compared when the two fractions refer to the same whole. • Common numerators. • Common denominators. Students will able to: • Create common denominators in order to compare two fractions. • Create common numerators in order to compare two fractions. • Compare two fractions with different numerators and different denominators by comparing to a benchmark fraction. • Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. Learning Goal 11: • Compare two fractions with different numerators or different denominators, recording comparison with >, =, or <, and justifying the conclusion using visual fraction models.
4.NF.C.6 (**M**) 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;	MP.7 Look for and make use of structure.	Concepts: • Relationship between place value (decimals) and

locate 0.62 on a number line diagram.		fractions. Students will be able to: • Write a fraction with a denominator of 10 or 100 as a decimal. Learning Goal 12: • Given a fraction having a denominator of 10 or 100, write the corresponding decimal.
4.NF.C.7 (**M**) 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.	MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concepts: • No new concepts introduced. Students will be able to: • Represent a decimal using a model. • Compare two decimals to hundredths by reasoning about their size. • Explain 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). Learning Goal 13: • Compare two decimals to hundredths by reasoning about their size, demonstrating 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.
4.NF.C.5 (**M**) 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. (Clarification: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.)	MP.7 Look for and make use of structure.	Concepts: • Equivalent Fractions Students will be able to: • Add two fractions with respective denominators of 10 and 100 using equivalent fractions. Learning Goal 14: • Add two fractions with respective denominators of 10 and 100 by writing each fraction with denominator 100.

School/District Formative Assessment Plan

- Topic 9-1 through 9-10 Quick Check (found in Savvas Realize)
- Topic 10-1 through 10-5 Quick Check (found in Savvas Realize)
- Topic 11-1 through 11-4 Quick Check (found in Savvas Realize)
- Topic 12-1 through 12-6 Quick Check (found in Savvas Realize)

School/District Summative Assessment Plan

- Topic 9 Assessment
- Topic 10 Assessment
- Topic 11 Assessment
- Topic 12 Assessment

Benchmark & Alternative Assessments

- STAR Renaissance
- LinkIt Benchmarks
- Performance Task (found in Savvas Realize)

Focus Mathematical Concepts

Pre-requisite skills

- A fraction is a quantity formed when a whole is partitioned into equal parts where a unit fraction (1/b) is the quantity formed by 1 part when a whole is partitioned into b equal parts. (For example, ¼ is the quantity that is formed by 1 part of the 4 total parts when the whole is partitioned into 4 equal parts) (3.NF.A.1).
- A fraction a/b as the quantity formed by a parts, where each part has a size of 1/b. (For example, ¾ is the quantity that is formed by 3 parts of the 4 total parts where each part has a size of ¼.) (3.NF.A.1).
- Fractions are numbers and can be found or represented on the number line (3.NF.A.2).
- Represent and recognize a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts and that the endpoint of the part based at 0 locates the number 1/b on the number line (3.NF.A.2).
- Represent and recognize a fraction a/b on a number line diagram by marking off a lengths 1/b from 0 and that its endpoint locates the number a/b on the number line (3.NF.A.2)
- Add within 1000 with accuracy and efficiency using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction (3.NBT.A.2).
- Subtract within 1000 with accuracy and efficiency using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction (3.NBT.A.2).
- Represent a word problem with drawings and equations using a symbol for the unknown (2.OA.A.1).
- Solve one and two-step addition and subtraction word problems within 20 involving situations of adding to, taking from, putting together, taking apart, and comparing (2.OA.A.1).
- Solve simple two-step word problems using the four operations (3.OA.D.8).
- Represent two-step word problems using equations with a letter standing for the unknown quantity

(3.OA.D.8).

- Assess the reasonableness of answers in two-step word problems using mental computation and estimation strategies including rounding (3.OA.D.8).
- Estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l) (3.M.A.2).
- Multiply and divide within 100 using strategies such as the relationship between multiplication and division, or properties of operations (working towards accuracy and efficiency) (3.OA.C.7).
- Make a line plot showing measurement data, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters (3.DL.B.4).
- Compare fractions by reasoning about their size (3.NF.A.3).
- Two fractions are equivalent (equal) if they are the same size, or the same point on a number line (3.NF.A.3).
- Recognize and generate simple equivalent fractions (3.NF.A.3).
- Explain why two fractions are equivalent by using a visual fraction model (3.NF.A.3).
- Express whole numbers as fractions (3.NF.A.3).
- Recognize fractions that are equivalent to whole numbers (3.NF.A.3).
- Compare two fractions with the same numerator or the same denominator by reasoning about their size (3.NF.A.3).

Common Misconceptions

- Student has restricted his definition of fractional parts on the ruler so that he thinks that an inch is the specific distance from 0 to 1 and does not understand that an inch unit of length is an inch, anywhere on the ruler.
- Student writes fraction as part/part instead of part/whole.
- Students do not understand that when finding fractions of amounts, lengths, or areas, the parts need to be equal in size.
- Overgeneralizes the idea that “the bigger the denominator, the smaller the part” by ignoring numerators when comparing fractions.
- When adding fractions, generalizes the procedure for multiplication of fractions by adding the numerators and adding the denominators.
- When subtracting mixed numbers, always subtracting the smaller whole number from the larger whole number and subtracting the smaller fraction from the larger fraction.

Number Fluency

- 4.NBT.B.4 Add and subtract within 1,000,000.

District/School Tasks

- Pick A Project (found in Savvas Realize)
- Performance Tasks (found in Savvas Realize)

District/School Primary, Supplemental and Intervention Resources

- Envisions by Savvas (P)
- STAR Renaissance (S)
- Freckle Math (S)
- Connecting Math Concepts (I)
- Corrective Math (I)

Instructional Best Practices/Open Educational Resources

Illustrative Mathematics

Desmos

Numeracy Tasks

Building Thinking Classrooms Tasks

Open Middle Math Tasks

Resources from Dr. Eric Milou

Career Readiness, Life Literacies & Key Skills

9.1.5.CR.1	Compare various ways to give back and relate them to your strengths, interests, and other personal factors.
9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
9.4.5.CT.3	Describe how digital tools and technology may be used to solve problems.
9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.IML.2	Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).
9.4.5.IML.3	Represent the same data in multiple visual formats in order to tell a story about the data.
9.4.5.TL.2	Sort and filter data in a spreadsheet to analyze findings.

Computer Science & Design Thinking

8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.2	Compare the amount of storage space required for different types of data.
8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
8.1.5.DA.4	Organize and present climate change data visually to highlight relationships or support a claim.
8.1.5.DA.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Interdisciplinary Connections

4-PS4-1	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
RI.MF.4.6	Use evidence to show how graphics and visuals (e.g., illustrations, charts, graphs, diagrams, timelines, animations) support central ideas.
W.AW.4.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
W.WR.4.5	Conduct short research projects that use multiple reference sources (print and non-print) and build knowledge through investigation of different aspects of a topic.

W.SE.4.6	Gather relevant information from multiple print and digital sources; take notes, prioritize and categorize information; provide a list of sources.
4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
SL.UM.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
4-ESS1-1	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
4-ESS2-1	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
4-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth’s features.