Grade 3 Unit 3: Fractions as Numbers

Content Area: **Math**
Course(s): **Math Grade 3**
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NJSLS Math

MATH.3.OA.C.7	With accuracy and efficiency, multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
MATH.3.OA.D.8	Solve two-step word problems, including problems involving money, using the four operations. 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.
MATH.3.NBT.A.2	With accuracy and efficiency, add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
MATH.3.NF.A.1	Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.
MATH.3.NF.A.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram.
MATH.3.NF.A.2.a	Represent 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. Recognize that each part has size $1/b$ and that the endpoint of the part based at 0 locates the number $1/b$ on the number line.
MATH.3.NF.A.2.b	Represent a fraction a/b on a number line diagram by marking off a lengths $1/b$ from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.
MATH.3.NF.A.3	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
MATH.3.NF.A.3.a	Understand two fractions as equivalent (equal) if they are the same size. Understand two fractions as equivalent if they are located at the same point on a number line.
MATH.3.NF.A.3.b	Recognize and generate simple equivalent fractions by reasoning about their size, (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent with the support of a visual fraction model.
MATH.3.NF.A.3.c	Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.
MATH.3.NF.A.3.d	Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions with the support of a visual fraction model.
MATH.3.DL.A.1	Develop data-based questions and decide what data will answer the question. (e.g., “What size shoe does a 3rd grader wear?”, “How many books does a 3rd grader read?”)
MATH.3.DL.A.2	Collect student-centered data (e.g., collect data on students’ favorite ice cream flavor) or use existing data to answer data-based questions.
MATH.3.DL.B.3	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

MATH.3.DL.B.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.
MATH.3.G.A.2	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

Unit Focus

- Solve problems involving the four operations, and identify and explain patterns in arithmetic.
- Develop understanding of fractions as numbers.

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
3.OA.D.8 (M) Solve two-step word problems, including problems involving money, using the four operations. 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. (Clarification: This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify	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 others. MP.4 Model with mathematics	Concepts: • Letters or symbols in an equation represent an unknown quantity. Students are able to: • Represent the solution to two-step word problems with equations. • Use a symbol to represent an unknown in an equation. • Use rounding as an estimation strategy.

a particular order) (Order of Operations)  Climate Change Example: Students may use the four operations to solve two-step word problems related to glacier retreat.	MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	• Explain, using an estimation strategy, whether an answer is reasonable. Learning Goal 1: • Write equations when solving two-step word problems, using a symbol for an unknown; find the value of an unknown in an equation involving any of the four operations and use estimation strategies to assess the reasonableness of answers.
3.NBT.A.2 (**A**) With accuracy and efficiency, add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	MP.2 Reason abstractly and quantitatively.	Concepts: • No new concepts introduced Students will be able to: • Add and subtract two 2-digit whole numbers within 750 with accuracy and efficiency. Learning Goal 2: • Fluently add and subtract (with regrouping) two 2-digit whole numbers within 750.
3.OA.C.7 (**M**) With accuracy and efficiency, multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concepts: • No new concept) introduced Students will be able to: • Multiply and divide within 75 with accuracy and efficiency. Learning Goal 3: • Fluently multiply and

		divide within 75 using strategies such as the relationship between multiplication and division.
3.DL.B.3 (**S**) Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.	Concepts: • Graphs organize information and contain labels. • Pictures and bars can represent numbers in graphs. • Different graphs may display different scales. Students will be able to: • Draw scaled picture graphs. • Draw scaled bar graphs. • Analyze, interpret and create bar graphs and pictographs in real world situations. • Solve "how many more" and "how many less" problems using scaled bar graphs. Learning Goal 4: • Create a scaled picture graph and a scaled bar graph accurately to represent a given data set. Interpret data presented in the graphs to answer questions related to "how many more" and "how

		many less."
3.G.A.2 (**S**) Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concepts: • A unit fraction represents one part of a whole that has been divided into equal parts. Students will be able to: • Partition shapes into equal areas. • Express the area of each part as a unit fraction of the whole shape. Learning Goal 5: • Partition shapes into equal parts and express the area of each part as a unit fraction of the whole shape (e.g.,1/2, 1/3, 1/4, etc.).
3.NF.A.1 (**M**) Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. For example: If a rectangle (i.e. the whole) is partitioned into 3 equal parts, each part is 1/3. Two of those parts would be 2/3.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concepts: • Wholes, when partitioned into equal parts, contain parts representing a unit fraction and each part is the same size. • Each part has the same name and represents a unit fraction (one-half, one-

	MP.7 Look for and make use of structure.	third, one-fourth, one-sixth, one-eighth). • The denominator is the total number of parts in the whole. • The numerator is the number of parts in a given fraction. • Fraction 1/b is the quantity formed by 1 part when a whole is partitioned into b equal parts. • Fraction a/b as the quantity formed by a parts of size 1/b (e.g. 10/2 is 10 parts and each part is of size 1/2). Students will be able to: • Partition rectangles, and other shapes, into halves, thirds, fourths, sixths and eighths. • Identify the fractional name of each part. • Model and explain that a fraction a/b as the quantity formed by a parts of size 1/b (e.g. 10/2 is 10 parts and each part is of size 1/2). Learning Goal 6: • Demonstrate how a fraction a/b represents a quantity formed by a parts, each of size 1/b.
3.NF.A.2a-b (**M**) Understand a fraction as a number on the number line; represent fractions on a number line diagram.	MP.5 Use appropriate tools strategically.	Concepts: • A fraction is a number and has its place on the number line.

a. Represent 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. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. For example, partition the number line from 0 to 1 into 3 equal parts, represent 1/3 on the number line and show that each part has a size 1/3. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.		• When placing unit fractions on a number line, the space between 0 and 1 is the whole and must be partitioned into equal parts. • Each part of a whole has the same size (one-half, one-third, one-fourth, one-sixth or one-eighth). • Parts of the whole that begin at 0 and end at 1/b on the number line is the location of fraction 1/b (one-half, one-third, one-fourth, one-sixth, or one-eighth). Students will be able to: • Partition a number line into parts of equal sizes between 0 and 1 (halves, thirds, fourths, sixths and eighths). • Plot unit fractions on the number line. • Identify multiple parts (of length 1/b) on the number line. • Plot a fraction on the number line by marking off multiple parts of size 1/b. • Plot fractions equivalent to whole numbers including 0 and up to 5. Learning Goal 7: • Draw a number line depicting the position of 1/b (with b = 2, 3, 4, 6, or 8) • Represent the unit fraction 1/4 on the number line by partitioning the number

		line between 0 and 1 into 4 equal lengths and name the point at the end of the first length as the position of the unit fraction 1/4 • Apply the same method for placing points 1/2, 1/3, 1/6, and 1/8 on the number line. Learning Goal 8: • Draw a number line depicting the position of fraction a/b (with b = 2, 4, 3, 6, or 8, and including whole numbers up to 5).
3.DL.B.4 (S) Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically.	Concepts: • Show measurements on a line plot to display the information in an organized way. Students will be able to: • Measure length using rulers marked with inch, quarter inch and half inch. • Generate measurement data by measuring length and create a line plot of the data. • Accurately measure several small objects using a standard ruler and display findings on a line plot. • Display data on line plots with horizontal scales in whole numbers, halves, and quarters. Learning Goal 9: • Create a line plot to show the measurement data,

		ensuring the horizontal scale is marked in appropriate units (whole numbers, halves, or quarters).
3.NF.A.3a-d (**M**) Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size. Understand two fractions as equivalent if they are located at the same point on a number line. b. Recognize and generate simple equivalent fractions by reasoning about their size, (e.g. 1/2= 2/4, 4/6=2/3). Explain why the fractions are equivalent with the support of a visual fraction model. c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3=3/1; recognize that 6/1=6; locate 4/4 and 1 at the same point on a number line diagram. d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions with the support of a visual fraction model.	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concepts: • Comparing fractions, each referencing the same whole. • Fractions are equivalent if they are the same size. • Fractions are equivalent if they are at the same point on a number line. Students will be able to: • Find equivalent fractions (limited to fractions with denominators 2, 3, 4, 6, and 8). • Explain why two fractions are equivalent; use a visual fraction model to support explanation. • Write whole numbers as fractions. • Identify fractions that are equivalent to whole numbers. • Compare two fractions having the same numerator by reasoning about their size. • Compare two fractions having the same denominator by reasoning about their size. • Explain why comparing fractions that do not have the same whole is not valid

		(reason about their size and support reasoning with a model). • Use <, =, and > symbols to write comparisons of fractions and justify conclusions with a visual fraction model. Learning Goal 10: • Generate simple equivalent fractions, explain why they are equivalent, and support the explanation with visual fraction models; locate them on the number line. Learning Goal 11: • Express whole numbers as fractions, identify fractions equivalent to whole numbers and locate them on the number line. Learning Goal 12: • Compare two fractions having the same numerator; compare two fractions having the same denominator; reason about their size and use the symbols >, =, or < to record the comparison.
3.DL.A.1 (**A**) Develop data-based questions and decide what data will answer the question. (e.g. "What size shoe does a 3rd grader wear?", "How many books does a 3rd grader read?")	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics.	Concepts: • Developing data-based questions. • Deciding what data will answer questions. Students will be able to: • Identify different types of questions that can be answered with data.

	MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	• Formulate data-based questions related to a given topic. • Determine the appropriate type of data needed to respond to specific questions. • Justify the selection of data based on the question being asked. Learning Goal 13: • Develop data-based questions and decide what data will answer the question.
3.DL.A.2 (A) Collect student-centered data (e.g. collect data on students' favorite ice cream flavor) or use existing data to answer data-based questions.	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concepts: • Collecting data. • Analyzing data. Students will be able to: • Gather student-centered data. • Analyze collected or existing data. Learning Goal 14: • Gather information, organize it, interpret results, and present findings effectively, using real-world examples.

School/District Formative Assessment Plan

- Topic 11-1 through 11-4 Quick Check (found in Savvas Realize).
- Topic 12-1 through 12-8 Quick Check (found in Savvas Realize).

- Topic 13-1 through 13-8 Quick Check (found in Savvas Realize).

School/District Summative Assessment Plan

- Topic 11 Assessment
- Topic 12 Assessment
- Topic 13 Assessment

Focus Mathematical Concepts

Pre-requisite skills

- Represent a word problem using drawings and equations using a symbol for the unknown (2.OA.A.1).
- Solve one and two-step addition and subtraction word problems within 100 involving situations of adding to, taking from, putting together, taking apart, and comparing (2.OA.A.1).
- Use concrete models and a place value strategy to add and subtract within 1000, and relate the written strategy to the model (2.NBT.B.7).
- Use drawings and a place value strategy to add and subtract within 1000, and relate the written strategy to the drawing (2.NBT.B.7).
- Use concrete models and a strategy based on properties of operations and/or the relationship between addition and subtraction to add and subtract within 1000, and relate the written strategy to the model (2.NBT.B.7).
- Use drawings and a strategy based on properties of operations and/or the relationship between addition and subtraction to add and subtract within 1000, and relate the written strategy to the drawing (2.NBT.B.7).
- Draw a picture graph to represent a data set with up to four categories (2.DL.B.4).
- Draw a bar graph to represent a data set with up to four categories (2.DL.B.4).
- Use information from a bar graph to solve simple put together, take-apart, and compare problems (2.DL.B.4).
- Partition circles and rectangles into two, three, or four equal shares (2.G.A.3).

- Describe the shares using the words halves, thirds, fourths, half of, a third of, or fourth of (2.G.A.3).
- Describe the whole as two halves, three thirds, four fourths (2.G.A.3).
- Recognize that equal shares of identical wholes need not have the same shape (2.G.A.3).
- Use equally spaced points of a number line to represent whole numbers as lengths from 0 (2.M.B.6).
- Represent whole number sums within 100 on a number line diagram (2.M.B.6).
- Represent whole number differences within 100 on a number line diagram (2.M.B.6).
- Measure lengths of objects after selecting appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes (2.M.A.1).

Common Misconceptions

- The idea that the smaller the denominator, the smaller the piece or part of the set, or the larger the denominator, the larger the piece or part of the set, is based on the comparison that in whole numbers, the smaller a number, the less it is, or the larger a number, the more it is. The use of different models, such as fraction bars and number lines, allows students to compare unit fractions to reason about their sizes.
- Students think all shapes can be divided the same way. Present shapes other than circles, squares or rectangles to prevent students from overgeneralizing that all shapes can be divided the same way.

Number Fluency

- 3.OA.C.7 Multiply and divide within 100; Know single digit products from memory.
- 3.NBT.A.2 Add and subtract within 1000.

District/School Tasks

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

District/School Primary and Supplementary Resources

- Envisions by Savvas
- STAR Renaissance

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 Awareness, Exploration, Preparation, and Training

WRK.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.

Life Literacies & Key Skills

TECH.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).
TECH.9.4.5.CT.3	Describe how digital tools and technology may be used to solve problems.
TECH.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).
TECH.9.4.5.TL.2	Sort and filter data in a spreadsheet to analyze findings.
TECH.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).
TECH.9.4.5.IML.3	Represent the same data in multiple visual formats in order to tell a story about the data.

Interdisciplinary Connections

ELA.RI.CI.3.2	Recount in oral and written form the key details from a multi-paragraph informational text and explain how they support the main idea.
ELA.RI.IT.3.3	Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
SCI.3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar

	organisms.
ELA.W.IW.3.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
SCI.3-LS3-2	Use evidence to support the explanation that traits can be influenced by the environment.
SCI.3-LS4-1	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
ELA.W.SE.3.6	Use discussion, books, or media resources to gather ideas, outline them, and prioritize the information to include while planning to write about a topic.
SCI.3-LS4-2	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
ELA.SL.PI.3.4	Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
SCI.3-LS4-3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.