Grade 3 Math Unit 3- Number and Operations - Fractions

UNIT OVERVIEW

In Grade 3, math instruction should focus around 4 critical areas. This unit will address Critical Focus Area # 2, **Developing understanding of fractions, especially unit fractions** (fractions with numerator 1). (See Connections for explanation)

This unit will address work in 1 cluster:
- Develop understanding of fractions as numbers. * (See Connections for explanation)

STANDARDS

CC_Common Core State Standards - Mathematics (2010) - Grade 3
Domain 3.NF Number and Operations-Fractions
Cluster Statement: Develop understanding of fractions as numbers.
Standard 3.NF.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.
Standard 3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.
3.NF.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.
3.NF.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.
Standard 3.NF.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
3.NF.3.a Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
3.NF.3.b Recognize and generate simple equivalent fractions, (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.
3.NF.3.c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.
3.NF.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, e.g., by using a visual fraction model.

CONTENT ELABORATIONS

3.NF.1	This standard refers to the sharing of a whole being partitioned or split. Fraction models in third grade include area (parts of a whole) models (circles, rectangles, squares) and number lines. Set models (parts of a group) are not explored in third grade. Students should focus on the concept that a fraction is made up of many pieces of a unit fraction, which has a numerator of 1. For example, the fraction 3/5 is composed of 3 pieces that each have a size of 1/5. Some important concepts related to developing understanding of fractions include: - Understand fractional parts must be equal-sized. - The number of equal parts tell how many make a whole. - As the number of equal pieces in the whole increases, the size of the fractional pieces decreases. - The size of the fractional part is relative to the whole. Ex., The number of children in one-half classroom is different than the number of children in one-half of a school. - When a whole is cut into equal parts, the denominator represents the number of equal parts. - The numerator of a fraction is the count of the number of equal parts. Ex., 3/4 means that there are 3 one-fourths. Students can count "one fourth, two fourths, three fourths". Students express fractions as "fair sharing", parts of a whole, and parts of a set. They use various contexts (candy bars, fruit, cakes) and variety of models (circles, rectangles, squares, fraction bars and number lines) to develop understanding of fractions and represent fractions. Students need many opportunities to solve word problems that require fair sharing. To develop understanding of fair shares, students first participate in situations where the number of objects is greater than the number of children and then progress into situations where the number of objects is less than the number of children. **MP.1, MP.4, MP.7** should be emphasized.
3.NF.2	The number line diagram is the first time students work with a number line for numbers that are between whole numbers. Students transfer their understanding of parts of a whole to partition a number line into equal parts. There are two new concepts addressed in this standard which students shuld have time to develop. 1.) On a number line from 0 to 1, students can partition it into equal parts and recognize that each segmented part represents the same length. 2.) Students label each fractional part based on how far it is from zero to the endpoint. **MP.1, MP.4, MP.7** should be emphasized.
3.NF.3	An important concept when comparing fractions is to look at the size of the parts and the number of the parts. For example, 1/8 is smaller than 1/2 because when 1 whole is cut into 8 pieces, the pieces are much smaller than when 1 whole is cut into 2 pieces.
3.NF.3a-b	**3.NF.3a-3NF.3b** These standards call for students to use visual fraction models (area models) and number lines to explore the idea of equivalent fractions. Students should only explore equivalent fracrions using models, rather than using algorithms or procedures.
3.NF.3c	**3.NF.3c** This standard includes writing whole numbers as fractions. The concept relates to fractions as division problems, where the fractions 3/1 is 3 wholes divided into one group. This standard is the building block for later work where students divide a set of objects into a specific number of groups. Students must understand the meaning of a/1.

3.NF.3d	This standard involves comparing fractions with or without visual fraction models including number lines. Experiences should include: - Encourage students to reason about the size of pieces, the fact that 1/3 of a cake is larger than 1/4 of the same cake. Since the same cake (the whole) is split into equal pieces, thirds are larger than fourths. - Students should reason that comparisons are only valid if the wholes are identical. For example, 1/2 of a large pizza is different amount than 1/2 of a small pizza. Students should be given opportunities to discuss and reason about which 1/2 is larger. - An important concept when comparing fractions is to look at the size of the parts and the number of parts. Students recognize when examining fractions with common denominators, the wholes have been divided into the same number of equal parts. So the fraction with the larger numerator has the larger number of equal parts. -To compare fractions with the same numerator but different denominators, students understand that each fraction has the same number of equal parts but the size of the parts different. They can infer that the sme number of smaller pieces is less than the same number of bigger pieces. **MP.1, MP.2, MP.3, MP.4, MP.6, MP.7, MP.8** should be emphasized. This is the initial experience students will have with fractions and is best done over time. Students need many opportunities to discuss fractional parts using concrete models to develop familiarity and understanding of fractions. Expectations in this domain are limited to fractions with denominators 2, 3, 4, 6 and 8.

UNIT VOCABULARY

fraction	numerator	equivalent fractions
unit fraction	denominator	

BIG IDEAS

ENDURING UNDERSTANDINGS

- Fractional parts are equal shares of a whole or a whole set.
- The more equal sized pieces that form a whole, the smaller the pieces of the whole become.
- When the numerator and denominator are the same number, the fraction equals one whole.
- When the wholes are the same size, the smaller the denominator, the larger the pieces.
- The fraction name (half, third, etc) indicates the number of equal parts in the whole.

ESSENTIALS QUESTIONS

Choose a few questions based on the needs of your students

- How can fractions be used to represent numbers and their parts?

CONNECTIONS

In **Critical Focus Area #2,** students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

* This cluster relates to Grade 1 G.3; Partitioning traditional shapes into equal parts

Standards for Mathematical Practice (SMP)
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
MP.5 Use appropriate tools strategically
MP.6 Attend to precision
MP.7 Look for and make use of structure (Deductive reasoning)
MP.8 Look for and express regularity in repeated reasoning (Inductive Reasoning)

DEVELOP UNDERSTANDING OF FRACTIONS AS NUMBERS

	CONTENT	SKILLS
3.NF.1	Understand that a fraction is composed of many pieces of a unit fraction.	Understand that a fraction is composed of many pieces of a unit fraction. 1. Understand fractional parts must be equal-sized. 2. Understand that the size of the fractional part is relative to the whole. 3. Recognize a unit fraction. (¼ is the quantity formed when the whole is partitioned into 4 equal parts) 4. Express a fraction as the number of unit fractions. (2/3 = 1/3 and 1/3 of the whole 3/3) 5. Use accumulated unit fractions to represent numbers equal to, less than and greater than one (1/3 and 1/3 is 2/3; 1/3, 1/3, 1/3, and 1/3 is 4/3) 6. Understand that as the number of equal pieces in the whole increases, the size of the fractional pieces decreases. 7. Express fractions as fair sharing and parts of whole using a variety of models (circles, squares, rectangles, fraction bars and number lines)
3.NF.2a	Represent a fraction 1/b on a number line diagram.	Represent a fraction 1/b on a number line diagram. 1. Define the interval from 0 to 1 on a number line as the whole. 2. Divide a whole on a number line into equal parts. 3. Recognize that the equal parts between 0 and 1 have a fractional representation. 4. Represent each equal part on a number line with a fraction. 5. Explain that the end of each equal part is represented by a fraction (1/the number of equal parts).

3.NF.2b	Represent a fraction a/b on a number line diagram.	Represent a fraction a/b on a number line diagram. 1. Define the interval from 0 to 1 on a number line as the whole. 2. Divide a whole on a number line into equal parts. 3. Represent each equal part on a number line with a fraction. 4. Explain that the endpoint of each equal part represents the total number of equal parts.
3.NF.3a-b	Understand equivalent fractions.	Understand equivalent fractions. 1. Describe equivalent fractions. 2. Recognize simple equivalent fractions. 3. Compare fractions by reasoning about their size to determine equivalence. 4. Use number lines, size, visual fraction models, etc. to find equivalent fractions.
3.NF.3c	Express whole numbers as fractions.	Express whole numbers as fractions. 1. Recognize whole numbers written in fractional parts on a number line. 2. Recognize the difference in a whole number and a fraction. 3. Explain how a fraction is equivalent to a whole number.
3.NF.3d	Compare two fractions with the same numerator or the same denominator by reasoning about their size.	Compare two fractions with the same numerator or the same denominator by reasoning about their size. 1. Explain what the numerator in a fraction represents and its location. 2. Explain what the denominator in a fraction represents and its location. 3. Recognize whether fractions refer to the same whole. 4. Determine if comparisons of fractions can be made (if they refer to the same whole). 5. Compare two fractions with the same numerator by reasoning about their size. 6. Compare two fractions with the same denominator by reasoning about their size. 7. Record the results of comparisons using symbols >, =, or <. 8. Justify conclusions about the equivalence of fractions.

UNIT RESOURCES

Common Core Model Curriculum
McGraw-Hill, **My Math** Chapter 10
Hands-on Standards Number & Operations Lessons #15, 16, 17, & 18
Manipulatives : fraction circles, 2-color counters, Fraction Tower equivalency cubes, fraction bars or strips
Deb Diller Math Work Stations materials & process
Number Talks by Sherry Parrish
Georgia Math frameworks, Grade 3 Unit 5
Smart Board Resources
United Streaming: Understanding What Fractions Are, Math Mastery: Fractions
Singapore Math
Fun with fractions http://illuminations.nctm.org/LessonDetail.aspx?ID=L543
SCS Math Resources: Introducing Fractions, Fraction Flags, Fraction Monkeys, Name the Fraction, Show the Fraction Possible Literature: Eating Fractions by Bruce McMillan; Gator Pie by Louise Matthews; Mega-Fun Fractions by Marcia Miller and Martin Lee