SCUSD

3rd Grade Unit of Study

Introduction to Fractions

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| *DRAFT*  **Unit of Study**  **Introduction to Fractions** | | | | |
| **Grade:** 3 | | **Topic:** Numbers and Operations: Fractions | | **Length of Unit:** 10-15 days |
| **Focus of Learning** | | | | |
| **Common Core Standards:**  **Develop understanding of fractions as numbers.**  **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*.  **3.NF.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram.  **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.  **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.  **3.NF.3** 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, or the same point on a number line.  **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.  **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 of 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, e.g., by using a visual fraction model.  **Supporting Standards:**  **Geometry 3.G - Reason with shapes and their attributes.**  **3.G.2** 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.* | | | | **Standards for Mathematical Practice:**   1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. |
| **Enduring Understanding(s):** *Students will understand that…*   * Fractions are a natural extension of the way that we use numbers * fractions are numbers that express relationships between the parts and the whole | | | | |
| **Essential Questions:** *These questions will guide student inquiry.*   * What is a fraction? * How are fractions related to whole numbers? * Why are fractions important? * How can I use what I know about whole numbers to help me better understand fractions? * Why does the size or the amount of the whole matter? * How can I represent fractions of different sizes? * How do we compare fractions? * How are fractions used in real life? | | | | |
| **Student Performance** | | | | |
| **Knowledge:***Students will understand/know…*   * Fractions can be represented as parts of a whole, parts of a set, parts of an area, as a measure, and as numbers on the number line. * The size or the amount of the whole matters when expressing relationships with fractions. * The more fractional parts used to make a whole, the smaller the parts. *E.g. eighths are smaller than fifths.* * Partitioning a whole into equal-sized pieces results in unit fractions. * The meaning of a denominator and a numerator * With a unit fraction, the greater the denominator the smaller the pieces. * Equivalent fractions are ways of describing the same amount by using different-sized fractional parts. * When comparing fractions, the whole must be the same. | | | **Application:***Students will be able to…*   * Build and manipulate fractions * Read, write, and label fractions * Identify fractions * Count fractions * Represent fractions as parts of a whole, parts of a set, on a number line, as an area… * Recognize and identify attributes of quadrilaterals * Divide shapes into equal parts * Express the area of equal parts of a shape as a unit fraction | |
| **Assessments** (Attached) | | | | |
| **Pre-Assessment:**   * Fractions (Prior Knowledge): “Tell me all you can about fractions”. Use words, pictures, numbers , and/or other representations to explain your thinking.   **Formative Interim Assessments:**   * Mid-Unit Check 1 & Mid Unit Check 2 (To be given after Lesson 6)   **Suggested Formative Assessments**   * + Illustrative Mathematics 3.NF Find 1, (a. use a unit fraction to find 1 on the number line; b. when the numerator is greater)   + Smarter Balanced Sample Item: MAT.03.ER.3.000NF.B.229 (Use between Lesson 2 and Lesson 3)   + Smarter Balanced Sample Item: MAT.03.TE.1.000NF.F.233 (Use between Lesson 4 and Lesson 5)   + Smarter Balanced Sample Item: MAT.03.ER.3.000NF.E.216 (Use between Lesson 4 and Lesson 5)   **Summative Assessment (Culminating Task)**   * Candy Bar Model –**Part I ONLY** if given at the end of lesson 6 | | | | |
| **Learning Experiences** *(Lesson Plans Attached)* | | | | |
| **Days** | **Lesson Sequence** | | | **Materials** |
|  | **Pre-Assessment:** **Fractions – Describe**  **Lesson 1:** **Sharing Equal Parts**  *Students will know…*   * wholes and sets can be divided into equal parts   *Students will be able to…*   * create equal parts by partitioning each whole or set into equal pieces; divide quadrilaterals (rhombuses, rectangles, squares) into equal parts | | |  |
|  | **Lesson 2:** **Fractions as Parts of a Whole**  *Students will know…*   * fractions can be represented as parts of a whole   *Students will be able to…*   * build fractions, identify fractions, and label fractions created with equal size pieces; divide quadrilaterals into equal parts | | | **Suggested Formative Assessment:**   * Smarter Balanced Sample Item: MAT.03.ER.3.000NF.B.229 |
|  | **Lesson 3:** **Modeling Fractions with Area Models**  *Students will know…*   * fractions can be represented as parts of an area   *Students will be able to…*   * read, write, label and, identify fractions as an area with equal size pieces; express the area of equal parts of a shape as a unit fraction | | |  |
|  | **Lesson 4:** **Modeling Fractions with Length of Measurement**  *Students will know…*   * fractions can be represented as a measure of length, and as a numbers on the number line   *Students will be able to…*   * read, write, label and, identify fractions as part of a whole on a number line with equal size pieces | | | **Suggested Formative Assessment:**   * Smarter Balanced Sample Item: MAT.03.TE.1.000NF.F.233 * Smarter Balanced Sample Item: MAT.03.ER.3.000NF.E.216 |
|  | **Lesson 5: Fractions as Parts of a Set**  *Students will know…*   * fractions can be represented as parts of a set   *Students will be able to…*   * build fractions, identify fractions and label fractions using equal sized parts of a set | | |  |
|  | **Lesson 6: Representing Fractions in Multiple Ways**  *Students will know…*   * fractions can be represented as parts of a whole, parts of a set, parts of an area, as a measure, and as numbers on the number line.   *Students will be able to…*   * represent fractions as parts of a whole, parts of a set, on a number line, and as an area with equal size parts; identify (unit fractions), read, write, and label fractions; Express the area of equal parts of a shape as a unit fraction | | |  |
|  | **Review and Assessment : Fraction Concepts Check Point**  *Students will:*   * propose, justify, and communicate solutions | | | **Formative Interim Assessment:**   * Mid-Unit Check 1 * Mid-Unit Check 2 * Candy Bars and Friends **(Part I ONLY)** |

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| **Resources** | |
| **Online** | **Text** |
| **Engage New York**  <http://www.engageny.org/resource/grade-3-mathematics-module-5>  **Georgia Department of Education**  <https://www.georgiastandards.org/Common-Core/Pages/Math.aspx>  **Illustrative Mathematics**  <http://www.illustrativemathematics.org/>  **Inside Mathematics**  <http://www.insidemathematics.org/>  **MARS tasks**  <http://map.mathshell.org/materials/index.php>  **Massachusetts Department of Elementary and Secondary Education** <http://www.doe.mass.edu/candi/commoncore/>  **Mathematics Navigator—*Knowing Fractions Module*, from Pearson**  **National Library of Virtual Manipulatives** <http://nlvm.usu.edu/en/nav/vlibrary.html>  **North Carolina Department of Public Instruction**  <http://www.dpi.state.nc.us/acre/standards/common-core-tools/#unmath>  **Progressions for the Common Core State Standards in Mathematics**  <http://ime.math.arizona.edu/progressions/>  **Smarter Balanced Assessment Consortium**  <http://www.smarterbalanced.org/smarter-balanced-assessments/#item> | **McGraw-Hill. *California Mathematics: Concepts, Skills, and Problem Solving: Grade 3*. New York: McGraw-Hill Companies, Inc. 2009.**  **Shoseki, Tokyo. *Mathematics International: Grade 3*. 2012 (Japanese Text)**  **Van de Walle, John, and LouAnn Lovin. *Teaching Student-Centered Mathematics: Grades K-3.* Vol. 1. Boston: Pearson, 2006.**  **Van de Walle, John, and LouAnn Lovin. *Teaching Student-Centered Mathematics: Grades 3-5.* Vol. 2. Boston: Pearson, 2006.** |

Lessons

**Introduction to Fractions – Lesson 1**

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| Unit Title: Introduction to Fractions  Lesson 1: Sharing Equal Parts of a Set | Approx. time:  1-2 days | CCSS-M Standards:  3.N.F.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. |
| A. **Focus and Coherence**  Students will know…   * Wholes as sets can be shared or divided into equal parts.   Students will be able to…   * Create equal parts by partitioning each whole or set into equal pieces; * Divide quadrilaterals (rhombuses, rectangles, squares) into equal parts.   Student prior knowledge:   * Understand the idea of separating quantity into two or more parts to be shared equally among friends (or fair sharing) * Concept of division * Understand what a “whole” is. * Understand what “equal” means.   Which math concepts will this lesson lead to?   * Make connections between the idea of fair shares and fractional parts * Fractions as parts of a whole * Naming fractional pieces * Understanding the relationship between the number of things to be shared and the number of sharers | | B. **Evidence** of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  **SMP 1 - Students will make sense and persevere by…**   * dividing a set of 10 brownies into equal parts and; divide quadrilaterals into equal parts..   **SMP 6 - Students will attend to precision by…**   * using and labeling the fractions “whole”, “parts”, “halves” * creating their own pictures to divide whole and quadrilaterals into equal parts. |
| Essential Question(s)   * Why is the concept of fair sharing important? (describe a relationship between the number of things to be shared and the number of sharers) * How are fractions related to whole numbers? (Fractional parts are equal shares or equal-sized portions of a whole or unit. A unit can be an object or a collection of things) | | |
| Formative Assessments   * “Tell Me All You Can about Fractions”. Use words, pictures, numbers, and/or other representations to explain your thinking. | | |
| Anticipated Student Preconceptions/Misconceptions   * Students might think that the parts do not have to be equal when a whole is divided. * Students might not think that size of the whole matters. | | |
| Materials/Resources (Manipulatives, Smarter Balanced Sample Questions)   * Cut out construction paper rectangles, circles, squares … to represent brownies, sandwiches, pizzas, crackers, candy bars, and so on. * Whiteboards or scratch papers, chart papers; markers, scissors | | |
| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* | | | |
| **Warm Up (2-5 Minutes)**   * On white boards, students will solve division problems: You have 8 apples and you want to share them equally among **you and three** other friends. How many apples will each of you get? Explain your thinking using pictures, words, and number sentences. (ex: 8 ÷ 4 = 2 apples each) | | | |
| **Lesson** (Lay out each step)  “Sharing Tasks“ from Teaching Student-Centered Mathematics Grade 3-5” by John A. Van de Walle Page 132  **Introduction** (1-5 Minutes)   * Teacher poses a sharing task in the form of a simple story problem and writes it in the board:   “Four children are sharing 10 brownies so that each one will get the same amount. How much (or show how much) can each child have?”  **Independent Practice or Solo Time** (3-5 minutes):   * Have each student work alone to make sense of the problem. Student may write the problem down, draw a picture, use cut out rectangles or any known strategy. (students are not to ask any questions to teacher or partners).   **Small Group-Share Time** (20-25 minutes):   * Have students in each group (consisting of 3-4 students) take turn (“Round Robin” format for example) and share responses on how they solved the problem. The goal is for the students to come to a consensus on the solution path. If there is more than one solution presented, have group discuss, ask questions, defend, or justify their answers to agree on one solution to present to the class.   Expected students’ responses: “I drew 10 rectangles representing 10 brownies. Each child will get 2 whole brownies, that makes 8 brownies are gone. I have 2 brownies left to share equally among 4 children. I divided each brownie into 2 equal parts that gives me 2 halves for one brownie, or 4 halves for the 2 remaining brownies. So each child can get one half of a brownie from the remaining brownies or a total of two and half brownies.”   * Each group will get a poster paper to record their chosen solution pathway. Poster should include 4 sections: 1) Key terms (four friends, 10 brownies, share equally), 2) strategy to be used to solve the problem (repeated subtractions, diagram…), 3) solution (charts, diagrams, number sentences, illustrations) and 4) check with work shown. * Teacher can ask questions such as “How do you know that your solution is correct? Does your solution answer the question? etc...” to solicit or probe for student deeper understanding. * Each student is responsible for one section on the poster and will share-out to the whole class. (Suggestion for students: If your method is chosen you get to pick which part of the poster you will be responsible for first).   **Whole Class Sharing** (20-30 minutes)   * Each group will share out completed posters (teacher will have previously selected the sequence of group presentations, going from the least sophisticated strategy to the most sophisticated strategy). * After the group has shared classmates are given a chance to ask questions and for clarification. * As groups share their solutions with the class, the class will make connections between the different solution paths based on teacher’s facilitating role by asking probing questions that highlight the connections among the different math strategies being used. | | | |
| **Closure** (2-5 minutes)  Ticket out the door.   * Teacher poses a similar sharing task in the form of a simple story problem and writes it in the board:   “Two children are sharing 5 cookies so that each one will get the same amount. How much (or show how much) can each child have?” Explain your work by using words, pictures, and number sentences. | | | |
| **Suggested Homework/Independent Practice**   * Four children will share 6 pizzas so that each one will get the same amount. How much pizza will each child have? Explain your work by using words, pictures, and number sentences. * Eight children will share 4 candy bars so that each one will get the same amount. How much candy bar will each child have? Explain your work by using words, pictures, and number sentences. * Four children will share 2 cookies so that each one will get the same amount. How much cookie will each child have? Explain your work by using words, pictures, and number sentences. | | | |

**Introduction to Fractions – Lesson 2**

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| Unit Title: Introduction to Fractions  Lesson 2: Fractions as Parts of a Whole | Approx. time:  1-2 days | CCSS-M Standards:  3.N.F.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. |
| A. Focus and Coherence  Students will know…   * fractions can be represented as parts of a whole.   Students will be able to…   * build fractions, identify fractions, and * label fractions created with equal size pieces; * divide quadrilaterals into equal parts.   Student prior knowledge:   * Concept of whole numbers. * Wholes and sets can be divided into equal parts. * Create equal parts in rhombuses, rectangles, and squares.   Which math concepts will this lesson lead to?   * Representing fractions in multiple ways as on number lines, geometric figures, etc… | | B. Evidence of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  SMP 1 - Students will make sense and persevere by…   * Explaining verbally and/or in writing why a diagram represents a certain fraction or why it does not * “When a whole is divided into 3 equal parts, it can be labeled in thirds.” * “One of the two parts in a whole is the same as one-half.”     SMP 4 - Students will model with mathematics by…   * Creating equal parts in the different models for fractions * Creating a whole by drawing 4 copies of one-fourth   SMP 6 - Students will attend to precision by…   * Labeling each fraction as parts of a whole in numeric   and word form   * Stating that “it takes 4 one-fourths to make one whole” |
| Essential Questions   1. What is a fraction? 2. How are fractions related to the whole? | | |
| Formative Assessments   * Part II and Part III of the lesson * Smarter Balanced Sample Item MAT.03.ER.3.000NF.B.229 | | |
| Anticipated Student Preconceptions/Misconceptions   * More pieces means greater amount or size. * Numerator can not be bigger than the denominator | | |
| Materials/Resources   * Rectangular fraction manipulative kits (commercially produced and/or student made) or use McGraw-Hill manipulative kit, Blackline masters can be found \_\_\_\_\_\_\_\_\_\_\_\_\_\_. * Pencil, paper clips/baggies (to contain kit) * Whiteboards and dry eraser markers\* * Math journals/notebooks   \*optional | | |

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| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* |
| **Warm Up**  Students use white boards (or paper) for the warm up.  Teacher tells the story: “Fifteen candy bars are shared equally among six friends. How many candy bars will each friend have?” Explain your thinking using pictures, words, and number sentences. |
| **Lesson**  **Part I**:  Each student receives a fraction kit (Fraction kit includes: 6 paper strips sized 4 inch by 1 inch per student).  One rectangle represents a whole, another color is the same sized rectangle divided in half, a third color is the same sized rectangle divided in fourths, etc. ( ½, ¼, 1/8, 1/3, 1/6).  After students have fraction kits:   * T, “What do you notice about these rectangles?” * Ss, “They are all the same size.” * Have students fold one rectangle into 2 equal parts. * T, “How many pieces did we fold this rectangle into?” * Ss, “Two.” * T charts, “So we will write /2 to show that there are two equal pieces (write on first part of rectangle). If we only want to look at the one part of the rectangle we can put a 1 above the 2 in the fraction (write 1/2). Who knows what we could label the second part of this rectangle?” * Ss, “1/2.” * T, “Let’s count how many halves we have altogether.” * Ss, “1/2, 2/2” * T, “What does this number mean?” (Point to the denominator then repeat with numerator) * Repeat above steps to create fraction strip showing thirds. * T, “If I wanted to show fourths, how would I fold the next strip?” * S, “Fold the strip into four parts.” * T, “How do you know that will show fourth?” * S, “Fourths means four, so four parts will show fourths.” * Repeat above steps to create fraction strips showing sixth and eighths.   **Part II**:  Arrange students in small groups of 2-3 students. Give them approximately ten minutes to consider questions such as:   * How many halves does it take to make a whole strip? * How many thirds does it take to make a whole strip? * How may fourths, sixths, eighths? * What relationships did you discover about fractions? * What do you notice about the size of the strips or pieces?   Have them record their observations about the fraction strips in their math journal.  Have each group share some of their comments.  **Part III**:  Distribute rectangles with unit fractions labeled on them (see attached), one per student.  Ask students what part of the whole they received.  Ask students to use the strip they received to determine the size of its whole and draw their whole.  Students may make fraction strips for their wholes, but do not need to. Wholes may be any shapes as long as they have □ parts.  Samples drawings: This rectangle represent 1/3 of a whole: 1/3 so whole = or or  Students will draw a whole by reproducing 3 times of the same rectangle (3 copies). |
| **Closure**  Ask students to write down all they know about 1/5.  Sample responses: “There are 5 equal parts in the whole.” or “It takes five one-fifths to make a whole.” or “1/5 is smaller than 1/4.” |
| **Suggested Homework/Independent Practice**  Give blank rectangular wholes and have students divide them into certain fractions and explain how they knew what fraction to label each rectangle with. |

**Homework**

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**Divide each rectangle into the fraction listed and color the fraction amount stated.**

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1. Divide into halves and color

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1. Divide into fourths and color

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1. Divide into thirds and color

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1. Divide into sixths and color
2. How many sixths does it take to equal one whole? How do you know?

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1. What do you think another name for **four 1/8 strips** might be called? How would you write that fraction? Draw a picture to represent that fraction.

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Unit Fraction Strips for Part III

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| Unit Title: Intro to Fractions  Lesson 3: Modeling Fractions with Area Models | Approx. time:  1 day  45-60 minutes | CCS-M Standards:  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*. |
| A. **Focus and Coherence**  Students will know…   * fractions can be represented as parts of an area   Students will be able to…   * read, write, label, and identify fractions of an area with equal size pieces and express them as a fraction * express one area of equal parts of a shape as a unit of fraction   Student prior knowledge:   * The fraction a/b divides the whole into b parts   Which math concepts will this lesson lead to?   * Adding and subtracting fractions * Comparing fractions | | B. **Evidence** of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  **SMP 1 - Students will make sense and persevere by…**   * applying their understanding when dividing shapes (circles, squares, etc…) into eights and labeling them * “When a whole is divided into 3 equal parts, it can be labeled in thirds.” * “One of the two parts in a whole is the same as one-half.”     **SMP 4 - Students will model with mathematics by…**   * Creating equal parts in the different models for fractions * Creating a whole by drawing 4 copies of one-fourth   **SMP 6 - Students will attend to precision by…**   * Labeling each fraction as parts of a whole in numeric   and word form   * Stating that “it takes 4 one-fourths to make one whole” * Demonstrating ability to divide, shade, and label shapes into EQUAL size pieces orally and in writing |
| Essential Question(s)   * What is a fraction? * How can I represent fractions of different shapes? | | |
| Formative Assessments-   * Smarter Balanced Sample Item MAT.03.ER.3.000NF.B.229 | | |
| Anticipated Student Preconceptions/Misconceptions-   * Difficulty in identifying and/or dividing the whole of different shapes into equal size pieces | | |
| Materials/Resources-   * Adapted from Engage New York, Grade 3, Module 5, ***Fractions as Numbers on the Number Line***, Lesson 3, pages 5.A.21-24 and 5.A.27-28 * (T) Rectangular and circle-shaped papers * (S) whiteboards or papers * template of different shapes to trace or premade worksheet of different shapes | | |

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| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* |
| **Warm Up**  Marcos has a 1-liter container of milk that he is going to share with his mother, father, and sister at dinner. Draw a picture to show how Marcos must share the container of milk so that all 4 of them get the same amount of milk. What fraction of the milk does each person get? |
| **Lesson –**  **Part I**: **Using rectangle shape**  T: I have a rectangle. I want to split it into 4 equal units.  Fold the paper so that the parts are not the same size. Then open it up to draw the lines where it was folded, and show the class. Invite the students to notice the inequality of the parts.  T: Let me try again. (Fold it equally into 4 equal parts.)  T: How many total units (or parts) did I split the whole into?  S: 4.  T: What is each fractional unit (or part) called?  S: 1 fourth or 1 quarter.  T: I’m going to shade in 3 copies of 1 fourth. (Shade in 3 units.) What fraction is shaded?  S: 3 fourths are shaded.  T: Let’s count them.  S: 1 fourth, 2 fourths, 3 fourths.  Individual Practice: Give each student one pre-cut rectangle.   * Have students fold rectangles into halves, draw a line along the fold, and label ½ on each part. * Have students refold paper, then fold in half again to make fourths. On the other side of the same rectangular paper, draw lines along the folds and label on each part. * Afterwards, discuss and use questions such as “How many equal pieces make the whole?”; “How did you know to use the 2 and the 4 on the bottom of the fractions?”   **Part II**: **Using a circle**  T: I have a circle. I want to split it into 2 equal parts.  Fold the paper so that the parts are not the same size. Then open it up to draw the lines where it was folded, and show the class. Again, invite the students to notice and analyze the inequality of the parts.  T: Let me try again. (Fold it into 2 equal parts.)  T: How many total units did I split the whole into?  S: 2.  T: Good. What’s the fractional unit called?  S: 1 half.  T: I’m going to shade in 1 unit. (Shade in 1 unit.) What fraction is shaded?  S: 1 half is shaded.  Individual Practice: Give each student one pre-cut circle.   * Students fold circles in fourths, draw the lines along the folds, and label ¼ on each part. * Refold paper and fold in half again to make eighths, draw the lines along the folds, and label 1/8 on each part. * Students will then shade a portion of the whole and identify the fraction. For example: student shades 2 eighths and labels 2/8.   **Part III**: **Using more shapes**  Having established the meaning of equal parts, proceed to briskly analyze the following shapes possibly using the brief sequence of questions mapped out with Shape 1:  **Shape 1:**  T: How many fractional units are there in all?  S: 3.  T: What’s each unit called?  S: 1 third.  T: How many units are shaded?  S: 2 thirds.  T: Count them.  S: 1 third, 2 thirds.  **Shape 2:**  **Shape 3:**   |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  |   This shapes provides opportunity for teachers to also demonstrate that the location of the parts in the whole do not affect the name of the fraction shown. For example:   |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | | or |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  |   **Shape 4:**  Repeat the steps and procedures with other shapes. Use more or fewer examples as needed.  T: Now take out your white board, and we’ll try to draw a few shapes and split them equally into smaller units.  T: Draw a rectangle and show a third. (Circulate while students draw.)  T: How many units do we have altogether?  S: 3.  T: Shade in 1 unit. (Circulate while students draw.) What fraction is shaded?  S: 1 third.  Select a couple student drawings to show the class.  Repeat sequence to have students show 2 sixths of a square, 3 fourths of a line segment, and other examples as needed.  **Part IV**: **Problem Set**  Distribute the Activity Sheets (see attached).  Students work independently for 5 minutes and correct their work with partner(s).  Description: C:\Users\Cristina\Pictures\ControlCenter4\Scan\CCI12282012_0001.jpg  Description: C:\Users\Cristina\Pictures\ControlCenter4\Scan\CCI12282012_0000.jpg  Whole Group Discussion:  Use the questions below to lead the discussion.  What is the same and different about these two problems?  What is the same and different about fair shares of a jug of milk and fair shares of a candy bar? (Though a fraction of a jug of milk and a fraction of a candy bar is clearly different, we might draw each of them by drawing a rectangle.)  How can drawing fourths help you to draw fifths well? |
| **Closure:** Ticket-out-the-Door  Tammy says that her picture shows fourths, but Devon disagrees. Who do you agree with and tell why? |
| **Suggested Homework/Independent Practice (see attached)**  Give each student a Homework page w/ rectangle, circle, and square to be divided and labeled at home; divide each shape into parts with equal areas; shade and label your area model to represent a fraction; Challenge problem for higher level add hexagon & octagon. Also included is an extended response task in the form of a word problem. |

**Activity Worksheet**

Name Date

1. Each shape is a whole divided into equal parts. Name the fractional unit and then count and tell how many of those units are shaded. The first one is done for you.

The unit is 1 fourth.

2 fourths are shaded.

1. Circle the shapes that are divided into equal parts. Write a sentence telling what “equal parts” means.
2. Each shape is 1 whole. Estimate to divide each into 4 equal parts. Name the fractional unit below.

**Activity Sheet** (Continued)

1. Each shape is 1 whole. Divide and shade to show a fractional unit of:

A half A sixth A third

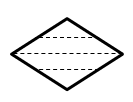
1. Each shape is 1 whole. Estimate to divide each into equal parts (Do not draw fourths.). Divide each whole using a different fractional unit. Write the name of the fractional unit on the line below the shape.

1. Charlotte wanted to equally share a candy bar with her 4 other friends. Draw Charlotte’s candy bar. Show how she can divide her candy bar so that Charlotte and her 4 friends each get an equal share. What fraction of the candy bar does each girl receive?

Each girl receives \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

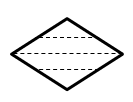
**Ticket-out-the-Door**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_

Tammy says that her picture shows fourths, but Devon disagrees. Who do you agree with and tell why.

**Ticket-out-the-Door**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_

Tammy says that her picture shows fourths, but Devon disagrees. Who do you agree with and tell why.

**Homework**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Task 1: Divide each shape into 4 parts with equal areas.

Task 2: Shade each shape to express the area shown by the fraction.

1 3 5

2 4 8

Task 3: Divide each shape into parts with equal areas. Shade the area represented by the fraction.

4 2 1

8 3 6

**Homework** (Continued)

Task 4: Divide each shape into parts with equal areas. Shade and label your area model to represent a fraction.

Problems:

Challenge Problems:

Task 5: An artist wants to draw a calendar on one sheet of paper to show each month of the year. Draw the artist’s calendar. Show how he can divide his calendar so that each month is given the same space. What fraction of the calendar bar does each month receive?

Each month receives \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Introduction to Fractions – Lesson 4**

|  |  |  |
| --- | --- | --- |
| Unit Title: Introduction of Fractions  Lesson 4: Modeling Fractions with Length of Measurement | Approx. time:  1-2 days | CCSS-M Standards: 3.NF.2  Understand a fraction as a number on the number line;  represent fractions on a number line diagram.   * 1. 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.   2. 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. |
| A. **Focus and Coherence**  Students will know…   * fractions can be represented as a measure of length, and as a number on the number line * on a number line, the fractional parts have to be the same length * fractions can be greater than one whole * a continual number line goes beyond whole   Students will be able to…   * read, write, label, and identify fractions as part of a whole on a number line with equal size pieces.   Student prior knowledge:   * Wholes can be divided into equal parts * Fractions can be represented as parts of a whole   Which math concepts will this lesson lead to?  • Represent fractions as a collection of unit fractions   * Compare fractions with same denominator | | B. **Evidence** of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  **SMP 1 - Students will make sense and persevere by…**   * drawing a number line and splitting it into fractional parts which have to be the same length   **SMP 6 - Students will attend to precision by…**   * labeling precisely whole numbers and fractions on a number line * explaining that each interval on a number line represents a distance of same length |
| Essential Question(s)   * How are fractions related to whole numbers? * How are fractions used in real life? * How is the length of a distance being represented on a number line? | | |
| Formative Assessments   * Smarter Balanced Sample item: MAT.03.TE.1.000NF.F.233 * Smarter Balanced Sample Item: MAT.03.ER.3.000NF.E.216 | | |
| Anticipated Student Preconceptions/Misconceptions   * Students do not understand that when partitioning a number line, the intervals must be equal. * Students do not count correctly on the number line. * A ruler or number line only has whole numbers | | |
| Materials/Resources   * (T) Board space, yard stick, large fraction strip for modeling * (S) Fraction kit, blank paper, rulers, pencils * Adapted from Engage New York, Grade 3, Module 5, ***Fractions as Numbers on the Number Line***, Lesson 14, pages 5.D. 4 – 5.D.11 | | |
| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* | | |
| **Warm Up :**  Anna is knitting a scarf. She says that she has completed 1 fourth of the total length of the scarf.  Draw a picture of the final scarf. Label what she has finished and what she still has to make. Draw a number bond with 2 parts to show the fraction she has made and the fraction she has not made. | | |
| **Lesson**  **Part I: Measure a Line of Length 1 Whole**  Teacher gives the following directions:   * Draw a horizontal line with your ruler that is a bit longer than 1 of your fraction strips. * Place a whole fraction strip just above the line you drew. * Make a small mark on the left end of your strip. * Label that mark 0 above the line. This is where we start measuring the length of the strip. * Make a small mark on the right end of your strip. * Label that mark 1 above the line. If we start at 0, the 1 tells us when we’ve travelled 1 whole length of the strip.   **Part II**: **Measure the Unit Fractions**  Teacher gives the following directions to students:   * Place your fraction strip with halves above the line. * Make a mark on the number line at the right end of 1 half. This is the length of 1 half of the fraction strip. * Label that mark. Label 0 halves and 2 halves. * Repeat the process to measure and make other unit fractions on a number line.   **Part III**: **Draw Number Bonds to Correspond to the Number Lines**  Once students have gotten good at making and labeling fraction number lines using strips to measure, have them draw number bonds to correspond. Use questioning as you circulate to help them see similarities and differences between the bonds, the fraction strips, and the fractions on the number line. You may want to use the following suggestions:   * What do both the number bond and number line show? * Which model shows you how big the unit fraction is in relation to the whole? Explain how. * How do your number lines help you to make number bonds?   **Part IV: Problem Set (see Activity Worksheets)**   * Solo Time: Students should do their personal best to complete the Problem Set within a set allotted time. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. * Pair-Sharing: Students should check and explain their work with a partner.   .   * Whole Class Sharing: teacher uses the following questions to guide a conversation to debrief the Problem Set and process the lesson. (**Note: Have students discuss the relationship between bonds, fraction strips, and number lines. It is essential that they understand the point on the number line indicates the length of the distance from 0 to that point**).   1. Describe the process for labeling unit fractions on the number line.   2. Why is the fraction strip an important tool to use when labeling unit fractions?   3. What does the fraction strip help you measure?   4. Look at the number line you made for Problem 3 on the Problem Set. What does each point on the number line mean? (Possible response: “ marks the distance from 0 – the end of the ribbon – to where Mrs. Lee sews on the first bead.”)   In the puppy-walking problem, the point is a point in time, not the whole length. In the ribbon problem, the point describes the length of the ribbon. Let them have fun with the difference between these two problems.  The puppy is in one location, like the mark on the line. The ribbon is the entire length. You may want to use the following suggestions to guide the discussion:   * 1. Think about the units of measure in Problem Set Problems 2 and 3. How are they the same? How are they different?   2. How does the unit of measure change what’s happening in the problem? How does that change what the number line shows?   3. How does what each number line shows stay the same? | | |
| **Closure**  After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students. | | |
| **Suggested Homework/Independent Practice** (see attached) | | |

**Activity Worksheet**

Name Date

1. Write number bonds. Partition the fraction strip to show the unit fractions of the number bond. Use the fraction strip to help you label the unit fractions on the number line. Include 0 unit fractions.

1

0 1

0 1

Halves

Thirds

Fourths

Fifths

1

0 1

0 1

1

1

**Activity Worksheet** (Continued)

1. Trevor needs to let his puppy outside every quarter (1 fourth) hour to potty train him. Draw and label a number line from 0 hours to 1 hour to show every 1 fourth hour. Include 0 fourths and 4 fourths hour. Label 0 hours and 1 hour, too.
2. A ribbon is one meter long. Mrs. Lee wants to sew a bead every m. The first bead is at m. The last bead is at the 1 m. Draw and label a number line from 0 m to 1 m to show where Mrs. Lee will sew in a bead. Label all the fractions including 0 fifths and 5 fifths. Label 0 meters and 1 meter, too.

**Ticket-out-the-Door**

Name Date

1. Write a number bond. Partition the fraction strip and draw and label the fractional units on the number line. Be sure to label 0 unit fractions.

0 1

Sixths

1

Write number bonds and draw a number line to help explain Problem 2.

1. Ms. Metcalf wants to share $1 equally between 5 students.
2. What fraction of a dollar will each student get?
3. How much money will each student get?

**Homework**

Name Date

1. Write number bonds. Partition the fraction strip to show the unit fractions of the number bond. Use the fraction strip to help you label the unit fractions on the number line. Include 0 unit fractions.

Sample:

0 1

0 1

1

1

1. Halves
2. Eighths
3. Fifths

1

0 1

**Homework** (continued)

1. Carter needs to wrap 6 presents. He lays the ribbon out flat and says, “If I make 6 equally spaced cuts, I’ll have just enough pieces. I can use 1 piece for each package, and I won’t have any pieces left over.” Does he have enough pieces to wrap all the presents?
2. Mrs. Rivera is planting flowers in her 1 meter long rectangular plant box. She divides the plant box into sections m in length, and plants 1 seed in each section. Draw and label a fraction strip representing the plant box from 0m to 1m. Represent each section where Mrs. Rivera will plant a seed. Label all the fractions.
3. How many seeds will she be able to plant in 1 plant box?
4. How many seeds will she be able to plant in 4 plant boxes?
5. Draw a number line below your fraction strip and mark all the fractions.

**Introduction to Fractions – Lesson 5**

|  |  |  |
| --- | --- | --- |
| Unit Title: Introduction to Fractions  Lesson 5: Fractions as Parts of a set | Approx. time:  1-2 days | CCSS-M Standards: 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. |
| A. **Focus and Coherence**  Students will know…   * Fractions can be represented as parts of a set. * Fractional parts of a collection of objects (set or whole) must be equal-sized collections of that type of object.   Students will be able to…   * Identify, read, count, and label fractions using equal sized parts of a set.   Student prior knowledge:   * Fractions are part of a whole. * Identify equal parts   Which math concepts will this lesson lead to?   * Representing fractions in multiple ways, and parts of a collection. | | B. **Evidence** of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  **SMP 1 - Students will make sense and persevere by…**   * identifying the total number of objects in the set or collection as the whole and the fractional part as the parts selected based on the characteristic of the set.   **SMP 4 - Students will model with mathematics by…**   * Modeling and labeling fractional parts of a set by drawing a picture showing the correct amount of items to represent the fraction.   **SMP 6 - Students will attend to precision by…**   * labeling fractional parts of sets of items. |
| Essential Question(s)   * What is a fraction? * How do we determine the fractional parts of a set or a collection? | | |
| Formative Assessments   * Math Journal the following day with a problem from this lesson. Student will solve problem, model using a picture, and explain in writing. * For example: Given 8 objects of different colors; explain what fraction is a certain color? Advanced students can also answer what fraction of the set if NOT that color? | | |
| Anticipated Student Preconceptions/Misconceptions: The students might…   1. Think that fractions can only relate to a whole being broken up. 2. Confuse the fraction by naming fraction according to the number selected and the number not selected; instead of naming the number selected and the total number. For example: In a group with 2 blue and 4 red = 2/4 blue; instead of 2/6 blue and 4/6 red). They write fractions as part/part instead of part/whole. 3. Think that parts of sets must be equal in size. 4. Not recognize fractions in a given situation. 5. Think that fractions have to be less than 1. 6. Count pieces without concern for the size of the whole. | | |
| Materials/Resources   * Counters in 2 colors, * copies of Quarters, Centimeter Grid, Squares or square sticky notes * Whiteboards and dry eraser markers\*, * Math journals/notebooks * Adapted from Mathematics Navigator, ***Knowing Fractions Module***, from Pearson   \*optional | | |

|  |
| --- |
| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* |
| **Warm Up:**  Write your favorite way to show 3/4 and explain how you know that your answer shows 3/4. (Example of an expected answer: explanation should define the whole and show an understanding that the whole is divided into 4 equal parts with 3 of those parts selected in some way.) |
| **Lesson**  **Part I**: **Using a Collection of Counters**  T: I have these many counters (show 6). One of the counters is red and the rest are yellow.  T: how many total counters do I have?  S: 6 counters.  T: How many counters are red?  S: 1 counter is red.  T: So I have 1 counter out of 6 counters that is red. What is the fraction that is red?  S: 1 sixth.  T: how many counters are yellow?  S: 5 sixths.  T: Let’s count them.  S: 1 sixth, 2 sixths, 3 sixths, 4 sixths, 5 sixths.  Guided Practice: Give each pair of students 10 two-color counters.   * Have student A select the total number of counters to work with (from 1-10) and student B to tell how many of those counters will show red color. Have student A tell the fractional part for red-color counters and student B tell the fractional part for yellow-color counters. * Second round, have student B begin this time with selecting the total number of counters to work with and student B tell how many of those counters will be red. Have each one of them tell the fractional part of each color counters. * Do two more rounds. * Have the pair record in their journal their favorite fractional part using pictures and fractional numbers and words. For example: they chose to record 3/8 yellow counters and 5/8 red counters   **Part II**: **Using a collection of Triangles**  T presents the problem to the students as they follow along.      3/7 of the triangles are shaded.  Alex says this statement is false. Alex is wrong.   1. Tell why Alex is wrong. 2. Explain what you think Alex is thinking.   Students can use the following sentence frame to support their communication skills.  There are \_\_\_\_\_\_\_\_\_\_\_ in the set. \_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_.  So \_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_.   1. Solo work: Have student work individually. Teacher monitors students to see if they can find fractional parts of sets. 2. Pair Share: Have students share and discuss their work with a partner. 3. Whole group share: ask 2-3 students to share their responses.   Notes: Answers:   1. There are 7 triangles in the set. Two of the 6 triangles are shaded. That is 3/7. The whole is the collection of   all 7 triangles in this case. Students c  b. Answers will vary. The most likely misconception is that the triangles are not equal parts because they are different sizes. This misconception comes from confusing the attribute that is being considered (triangle) with area or some other measurement.  If needed, teacher could use the following questions to assist students who have difficulty with this task.   * What is the whole in this problem? [answer: the entire set of 6 triangles] * What characteristics is the one that we need to consider to break the set into fractional part? [answer: the characteristic is that the shape is a triangle.] * How would you help Alex to understand his mistake?   **Part III**: **Using Quarters**  Teacher presents this problem by asking a student to read the task aloud as the group reads along.    Mary has 12 quarters. She plans to save 1/3 of them.   1. Cut out all the quarters and paste them on this page so that 1/3 of the quarters are in the piggy bank and the rest are next to the piggy bank.   C:\Users\stephanie-lee\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\0XUHEEWN\MC900356427[1].wmf   1. Write a sentence or two telling how you decided how many quarters to put in the piggy bank. 2. Solo work: Have student work individually. Teacher monitors students to see if they can find fractional parts of sets. 3. Pair Share: Have students share and discuss their work with a partner. 4. Whole group share: ask 2-3 students to share their responses.   Answers: a. There should be 4 quarters in the piggy bank and 8 quarters next to the piggy bank.  b. Answers will vary, but should include the idea of separating the quarters into three groups, each containing  an equal number of coins.  Note: Common error would include placing only 1 coin in the piggy bank or placing 3 coins in the piggy bank. Both of these errors would indicate that the student does not understand fractions in this context (sets or objects). |
| **Closure**:  On a half piece of paper, ask students to use pictures, numbers, and words to tell “What fraction of the class is girls?” and “What fraction of the class is boys?” A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. |
| Suggested Homework/Independent Practice: (see attached) |

**Activity Worksheet**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Task 1: Using a Collection of Triangles

3/7 of the triangles are shaded.

Alex says this statement is false. Alex is wrong.

1. Tell why Alex is wrong.
2. Explain what you think Alex is thinking.

**Activity Worksheet** (Continued)

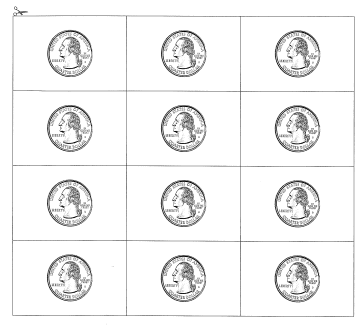
Task 2. Mary has 12 quarters. She plans to save 1/3 of them.

1. Cut out all the quarters and paste them on this page so that 1/3 of the quarters are in the piggy bank and the rest are next to the piggy bank.

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1. Write a sentence or two telling how you decided how many quarters to put in the piggy bank.

**Quarters for Task 2 (Piggy Bank)**



**Homework**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

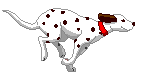
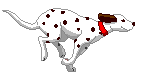
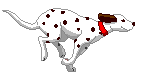
1. What part of the fruit is oranges?



There are \_\_\_\_\_\_\_\_\_\_\_ in the set. \_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_.

So \_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_.

2. What part of the animals is rabbits?

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There are \_\_\_\_\_\_\_\_\_\_\_ in the set. \_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_.

So \_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_.

3. Rachel was asked to shade 5/8 of these arrows. How many arrows should she shade? Explain your

thinking.

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**Introduction to Fractions – Lesson 6**

|  |  |  |
| --- | --- | --- |
| Unit Title: Fractions  Lesson 6: Represent and Identify Fractional Parts of Different Wholes | Approx. time:  1-2 days | CCSS-M Standards:  3.N.F.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.  **3.G.2** 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. |
| A. **Focus and Coherence**  Students will know…   * How to represent fractional parts of different wholes   Students will be able to…   * Create and represent fractions as a length, area, amount with equal sized pieces of different wholes. * Identify and express the area, length, and amount of equal parts of a shape as a unit fraction. * Identify and represent different fractional units   Student prior knowledge:   * Sharing equal parts * Fractions as part of a whole   Which math concepts will this lesson lead to?   * Compare unit fractions by reasoning about their size or amount using different sized models representing the whole | | B. **Evidence** of Math Practices  *What will students produce when they are making sense, persevering, attending to precision and/or modeling, in relation to the focus of the lesson?*  - Represent fractions as parts of a whole/ area of a whole  - Create fractions by partitioning each equal  piece into more equal pieces  - Divide shapes into equal parts |
| Essential Question(s)   * What is a fraction? * How are fractions related to different wholes? | | |
| Formative Assessments   * Parts I, II, and III of the lesson. | | |
| Anticipated Student Preconceptions/Misconceptions   * Children believe that by dividing a shape into parts, those parts will always be equal. | | |
| Materials/Resources   * Adapted from Engage New York, Grade 3, Module 5, **Fractions as Numbers on the Number Line** Exploration lesson 4 “Represent and Identify Fractional Parts of Different Wholes, Pages 5.A. 31—34 and 5.A. 37—41. * Yarns, yellow construction papers, brown construction papers, 12 ounce cups, clay or play-dough, beans or water | | |
| C. **Rigor**: fluency, deep understanding, application and dual intensity  *What are the learning experiences that provide for rigor? What are the learning experiences that provide for evidence of the Math Practices? (Detailed Lesson Plan)* | | |
| **Warm Up**   * Ana sliced an apple into 4 equal pieces. She ate one slice. Draw a picture to represent the 4 slices of an apple. Shade in the slice that Ana ate. What fraction of the apple did Ana eat? What fraction did she not eat? * Sample response: student should answer a problem with a complete statement: Ana ate 1 fourth. She did not eat 3 fourths. (A picture showing the corresponding fractional parts) | | |
| **Lesson: Exploration (adopted from Engage New York)**  Design the following stations for 3 students per station (more than 3 is not suggested).  Station A: Halves  Station B: Fourths  Station C: Eighths  Station D: Thirds  Station E: Sixths  Station F: Ninths  Station G: Fifths  Station H: Tenths  (Optional stations for sevenths and/or twelfths. Can set up any of the stations above more than once if needed. Organize students below grade level at the stations with the easier fractional units and students above grade elvel stations with the most challenging fractional units.)  Equip each station with the following suggested materials:   * + 1 meter length of yarn   + 1 rectangle piece of yellow construction paper ( 1” by 12”)   + 1 piece of brown construction paper (candy bar) (2” by 6”)   + 1 square piece of orange construction paper (4” by 4”)   + A number of 12 ounce cups corresponding to the denominator of the station’s fractional unit and 12 ounces of water (or beans) in a separate larger cup   + A 200 gram ball of clay or play dough (The key is to have precisely the same amount at each station.)   The students are to represent their fractions using the materials at their station.  Note:   * 1. Each item at their station represents one whole.   2. They are to show the whole partitioned into equal parts as designated by their station.   3. The entire quantity of each item must be used. So, for example, if showing thirds, all the clay must be used to do so, all the water (or beans) must be used too.   4. The clay is to be partitioned by subdividing it into smaller equal pieces formed into equal sized balls. Demonstrate for the students.   **Part I**:  To get them going, give as little direction as possible but enough for your particular class. Ask for clarification of the task by the students.  Note: It is suggested to work without scissors or cutting. Paper and yarn are folded. Pencil can be used on the paper to designate equal parts rather than folding.  Give students 15 minutes to create their display and record on a chart paper.  Next, conduct a “museum walk” where they tour the work of the other stations. (As students move around the room during the “museum walk”, have students gently and respectfully pick up the materials to encourage better analysis. This will encourage more talk, too.)  Before the “museum talk” review the following questions, posted on a chart paper, to guide students analysis and discussions. If the analysis dwindles during the tour, monitor and redirect them back to the questions.  **Part II**: **“Museum Walk”**  Questions to think and discuss about:   1. Identify the fractional unit.   2. Think about how that unit relates to your own and to other units.  3. Think about how the units relate to each other at that station.  4. Compare the yellow strip to the yarn.  5. Compare the yellow strip to the brown paper or the candy bar.   1. Compare the water (or beans) to the clay.   **Part III: Problem Set** **(see p. 5, 6, & 7)**  **Lesson Objective:** Represent and identify fractional parts of different wholes. Post all the stations’ chart paper around the room.   1. Students should do their personal best to complete the Problem Set by referring to those charts. Students do this part alone. 2. Have students review their solutions for the Problem Set by comparing answers with a partner before going over answers as a class.   Look for and address misconceptions or misunderstandings during this time period.   1. Whole class debrief: the intend is to invite students to reflect and actively process of the total learning experience. Use any combination of the following questions below to guide the discussion: 2. What were the different wholes we saw at each station that were the same? 3. What different fractional units did you see as you went from station to station? 4. What did you notice about different fractional units at the stations? 5. Which fractional units had the most and the smallest equal parts? 6. Which fractional units had the least and the largest equal parts? 7. What surprised you when you were looking at the different fractional units? | | |
| **Closure:** Exit Ticket  After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students. | | |
| **Suggested Homework/Independent Practice**   * See handout | | |

**Lesson \_\_\_\_ Problem Set**

Name Date

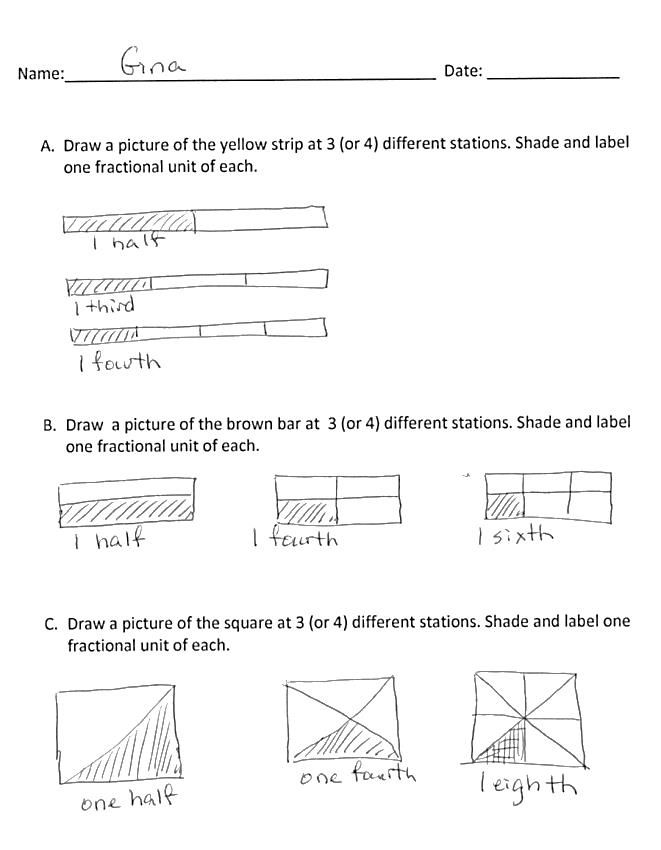
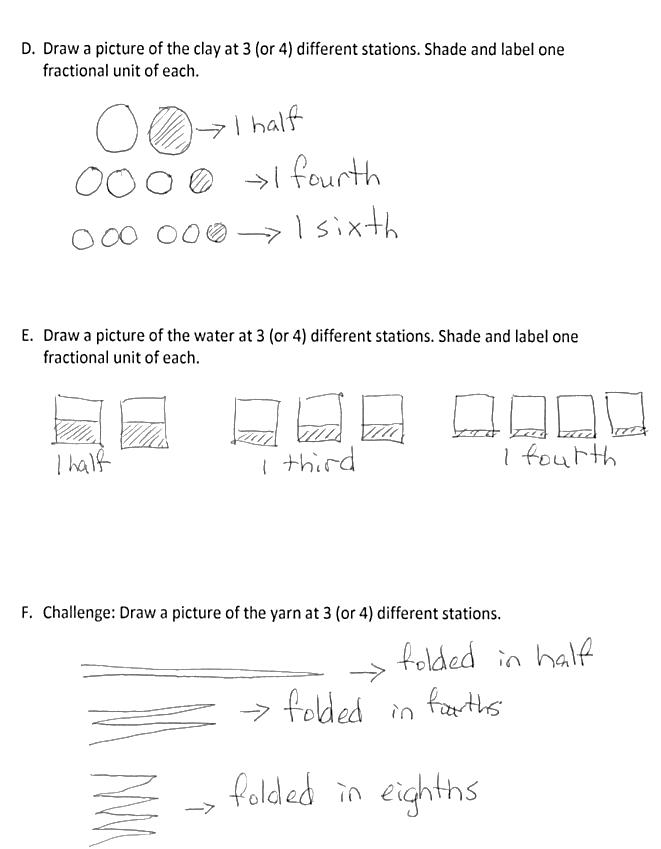
1. Draw a picture of the yellow strip at 3 (or 4) different stations. Shade and label one fractional unit of each.
2. Draw a picture of the brown bar at 3 (or 4) different stations. Shade and label one fractional unit of each.
3. Draw a picture of the square at 3 (or 4) different stations. Shade and label one fractional unit of each.

**Lesson \_\_\_\_ Problem Set** (Continued)

Name Date

1. Draw a picture of the clay at 3 (or 4) different stations. Shade and label one fractional unit of each.
2. Draw a picture of the water (or beans) at 3 (or 4) different stations. Shade and label one fractional unit of each.
3. Challenge: Draw a picture of the yarn at 3 (or 4) different stations. Label one fractional unit of each.

**Sample of Problem Set**



**Lesson \_\_\_\_\_Exit Ticket**

Name Date

Each shape is 1 whole. Estimate to equally partition the image to show the fractional unit of:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The shape represents 1 whole. Write the fractional unit of the shaded part and unshaded part.

The shaded part is \_\_\_\_\_\_\_\_\_\_\_\_\_.

The unshaded part is \_\_\_\_\_\_\_\_\_\_\_.

**Homework**

Name Date

Each shape is 1 whole. Estimate to equally partition the following images to show the fractional unit of:

1.

A B C D

­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.

A B C D

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.

A B C D

**Homework** (Continued)

1. Each of the shapes represent 1 whole. Match each shape to its unit fraction.

Suggested

Formative

Assessments

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Mid-Unit Check 1**

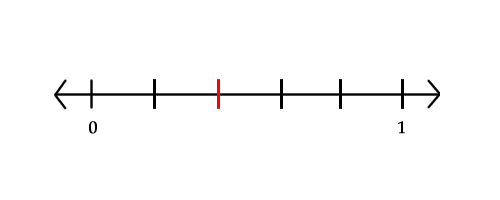
|  |  |
| --- | --- |
| one-third of the triangles | one-third of the area of the triangle |
| the arrow is pointing at one-third    1  0 | one-third of the area of the rectangle   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |

1. Circle each diagram above that shows 1/3.
2. Choose one of the diagrams that you circled. Say how you know this diagram shows 1/3.
3. Choose one of the diagrams that **y**ou did not circle. Say how you know this diagram does not show 1/3.

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Mid-Unit Check 2**

Sandra ran a race during track and field. The point on the line shows how far she ran. If the race is one mile long, how many miles did she run?

She ran **\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_.**

s

**Assessment Key**

**Mid-Unit Check 1**

|  |  |
| --- | --- |
| one-third of the triangles | one-third of the area of the triangle |
| the arrow is pointing at one-third    1  0 | one-third of the area of the rectangle   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |

1. Circle each diagram above that shows 1/3.
2. Choose one of the diagrams that you circled. Say how you know this diagram shows 1/3.

**Possible answers:**

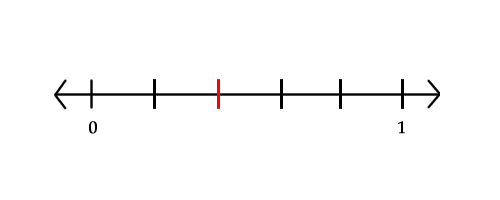
* 1. The number line shows 1/3rd because the whole is cut into 3 equal pieces and the arrow is pointing to the first section of that whole.
  2. The rectangle is divided into 9 equal pieces and the parts shaded are equal to 3 of those parts (two triangles make one of the small rectangular parts). 3/9th is equivalent to 1/3.

1. Choose one of the diagrams that **y**ou did not circle. Say how you know this diagram does not show 1/3.
   1. The triangles are a set of 4 and only 1 part is shaded, so it shows 1/4th not 1/3rd.
   2. The triangle with the circles inside does not show 1/3rd because even though the triangle is broken into three parts each part is not equal; therefore the black area is not 1/3 of the total area.

**Assessment Key**

**Mid-Unit Check 2**

Sandra ran a race during track and field. The point on the line shows how far she ran. If the race is one mile long, how far did she run?

She ran **\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_.**

2/5 mile

s

(Possible scaffolding question if needed: What fraction or portion of a mile did she run?)

3.NF Find 1

Alignments to Content Standards

* Alignment: 3.NF.A.2

1. Locate 1 on the number line. Label the point. Be as exact as possible.

1. Locate 1 on the number line. Label the point. Be as exact as possible.

3.NF Find 1

Commentary

The purpose of this task is to assess whether students understand fractions as being built from unit fractions and whether they can accurately locate fractions on the number line. This task could also be used in an instructional setting where students work in pairs or small groups to try to figure out how to use the given information to locate other numbers on the number line. If teachers give this task to students without scaffolding, it allows them an opportunity to engage in MP 1, Make sense of problems and persevere in solving them. This task includes the seeds of several important ideas.

Typically, students start with 0 and 1 on the number line and find unit (and other) fractions. In part (a) students must work in the other direction: they use a unit fraction to find 1 on the number line. This task reinforces the idea that a point on the number line represents a number. This kind of work also lays the groundwork for students to represent addition and subtraction on the number line in grade 4.

Part (b) reinforces the meaning of the numerator and the denominator. When students begin with the interval from 0 to 1, they typically start by partitioning that interval into unit fractions defined by the denominator of the fraction they are given. Here they must start with the numerator because they are partitioning the interval between 0 and 5/3. This part also helps reinforce the notion that when a fraction has a numerator that is larger than the denominator, it has a value greater than 1 on the number line.

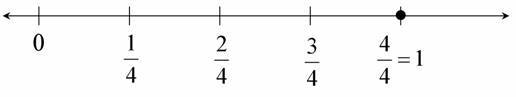
The following lists related tasks in order of sophistication:

* Locating Fractions Less than One on the Number Line
* Locating Fractions Greater than One on the Number Line
* Closest to 12
* Find 1
* Find 23
* Which is Closer to 1?

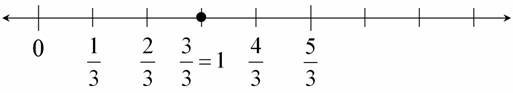
Solution: Find 1 using equal intervals

While it is not necessary to name all of the intervals on the number line, we expect many students will do so.

1. There are 4 fourths in 1, so if we take the length from 0 to 14 four times, we will find 1.



1. 53 is 5 equal pieces where 3 pieces make 1. So if we partition the interval between 0 and 53 into 5 pieces, each will be a third



and 3 thirds is 1.

Culminating Task:

“Candy Bars for Friends”

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Third Grade**

**Candy Bars for Friends**

Sarah went to the store and had only enough money to buy two candy bars for herself and her friends to share. The two candy bars that she bought are equal in size.

A B

**Part One**:

1. Sarah’s mother said that she could only have ½ of candy bar A.

Show how much of the candy bar Sarah can have.

1. Ana’s mother said that she could only have ¼ of candy bar B.

Show how much of the candy bar Ana can have.

1. a. When Sarah got ½ of candy bar A, how many parts was it divided into?

Explain how you know.

1. b. When Ana got ¼ of candy bar B, how many parts was it divided into?

Explain how you know.

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part Two**:

1. Which is more, ½ or ¼ of a candy bar?

Show your work and explain your answer.

1. a. Ana’s mother changed her mind and said that Ana could have the same amount of candy as Sarah. How much more of candy bar B would Ana need to take?

Show your work.

5. b. Ana’s mother told her that ½ equals 2/4. Explain why this is true.

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part Three:**

The next week, Sarah bought more candy bars to share with her friends. All three candy bars are equal in size.

* Sarah has 1/6 of candy bar A.

A

C

B

* Ana has ¾ of candy bar B.
* John has 1/2 of candy bar C.

1. Draw a picture to represent what part of the candy bar each person got.
2. a. Out of Sarah, Ana, and John, who has the largest part?

Show your work.

b. Who has the smallest part?

Show your work.

c. Show where each part is represented on a number line.

**0** **1**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Performance Task**

1. Sarah’s mother gets the remaining part of candy bar A.
2. How much of candy bar A will she get?

Show your work.

1. Who will have the largest part of the candy bars – Sarah, Ana, John, or Sarah’s mother?

Show your work and explain how you know.

1. Show where each part is represented on the number line, including

Sarah’s mother.

**0** **1**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Candy Bar Models**

**Rubric**

|  |  |  |
| --- | --- | --- |
| **Candy Bars for Friends**  Credit for specific aspects of performance should be given as follows: | Points | Total Points |
| 1. Candy bar correctly divided into one half. | 1 point | 1 point |
| 1. Candy bar correctly divided into one quarter. | 1 point | 1 point |
| 1. Solutions must include: 2. 2 parts   Explanation  **(Possible explanation):** I folded the paper in half and there were two parts.  **(Possible explanation):** I drew a line down the middle of the paper.   1. 4 parts   Explanation  **(Possible explanation):** I folded the paper into fourths and there were four parts.  **(Possible explanation):** I drew a line down the middle of the paper and then another line down the middle of each half.  **(Possible explanation):** I folded the paper in half once, and then folded the paper in half again. | 1 point  1 point  1 point  1 point | 4 points |
| 1. Solutions must include:   • ½ of a candy bar  • Correct representation of the comparison and size between  ½ and ¼.  • Explanation  **(Possible explanation):** I drew one picture to show ½  and I drew another picture to show ¼. Then I compared  their size.  **(Possible explanation):** I folded one paper in ½ and  then I folded the other paper into ¼ and compared their  size.  **(Possible explanation):** I know that the bigger the  denominator, the smaller the part of the whole. | 1 point  1 point  1 point | 3 points |
| 1. Solutions must include: 2. ¼ more of candy bar B   Correct representation of the fractional parts   1. Explanation   **(Possible explanation):** I drew a picture and shaded in  ½. I drew another picture and shaded in 2/4 and  noticed that they were the same size.  **(Possible explanation):** I folded one paper into ½ and  another paper into 2/4. Then I compared their size. | 1 point  1 point  1 point | 3 points |
| 1. Solutions must include:   • Candy bar A represented correctly  • Candy bar B represented correctly  • Candy bar C represented correctly | 1 point  1 point  1 point | 3 points |
| 1. Solutions must include: 2. Ana has the largest part   Correct representation of work   1. Sara has the smallest part   Correct representation of work   1. Candy bar A represented correctly on the number line   Candy bar B represented correctly on the number line  Candy bar C represented correctly on the number line | 1 point  1 point  1 point  1 point  1 point  1 point  1 point | 7 points |
| 1. **Performance Task**   Solutions must include:   1. Sarah’s mother will get 5/6 of candy bar A.   Correct representation of work.  b. Sarah’s mother will have the largest part.  Correct representation of work  **(Possible explanation):** I drew a picture of each person’s  part of the candy bar and compared sizes.  **(Possible explanation):** I folded paper to represent each  person’s candy bar and compared the sizes.  **(Possible explanation):** I used the number 12 as the least  common denominator when comparing the sizes.   1. Candy bar A represented correctly on the number line   Candy bar B represented correctly on the number line Candy bar C represented correctly on the number line  Sarah’s mother’s candy bar represented correctly on the number line | 1 point  1 point  1 point  1 point  1 point  1 point  1 point  1 point | 8 points |
|  | Total Points | 30 points |