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| **Title** | Introduction to Fractions |
| **Introduction** | Through this lesson students will understand that fractions are part of a whole. Students will gain knowledge of numerical and visual representations of fractions using read aloud books, categorizing fraction cards and exploring interactive web-based applications. |
| **Curriculum Alignment** | *Grade 3 Math - Standard 1 Numbers and Operations* ***NC Objectives:***  1.05 Use area or region models and set models of fractions to explore part-whole relationships.  1.05a Represent fractions concretely and symbolically (halves, fourths, thirds, sixths, eighths).  ***Common Core***  Develop an understanding of fractions as numbers. *Grade 4 Math – Standard 1* *Numbers and Operations* ***NC Objective:***  1.03 Solve problems using models, diagrams, and reasoning about fractions and relationships among fractions involving halves, fourths, eighths, thirds, sixths, twelfths, fifths, tenths, hundredths, and mixed numbers.  ***Common Core***  Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. |
| **Learning Outcomes** | * As a result of this activity students use specific vocabulary to explain fractions. Students will be able to graphically represent a fraction in a picture form. * After completing the single fraction finder worksheet at 80% accuracy students should be able to move on and complete the fraction assessment book. The book allows for the student to build their own fraction models. * Represent fractions concretely and symbolically (halves, fourths, thirds, sixths, eighths). |
| **Time Required and Location** | This lesson is designed to be completed in four – six 50 minute class periods. You may wish to extend or shorten this depending on your needs. |
| **Materials Needed** | One computer for each student or if computers are limited, then 2 students can share.Vocabulary Hunt worksheet for each childA Single Fraction Finder worksheet for each childPrint version of the fraction assessment bookPencils for each studentRead aloud books. Here are a few to choose from: Fraction Fun, by Adler, David A., Give me Half, by Murphy, Stuart J., and The Hershey’s Milk Chocolate Bar Fractions Book, by Pallotta, Jerry  **Technology resources**  This lesson can be completed using many different technology set-ups. For classrooms where technology is limited to one computer, LCD projector and Smart /Promethean board, the teacher can lead the lessons with student input. For classrooms with a 2 – 4 computer center, the teacher can demonstrate lessons 2 and 3, and then the students can rotate through in pairs. The best case scenario would be access to a computer lab.  All computers need Internet access with Java capabilities, and a printer is needed for teacher use. |
| **Participant Prior Knowledge** | Find doubles of a number. Find one half and one fourth of a geometric figure and of a set. Identify and indicate single and multiple fractional parts. Find one half and one fourth of a geometric figure and of a setExplore the terms half and equal shares. Identify and represent unit and non-unit fractions |
| **Facilitator Preparations** | Reserve the computer lab for specified time period. If possible bookmark all websites for student ease of use.Copy student worksheets (1 set for each student)Copy category worksheets (1 set for each student group of 4.) You may want to cut and laminate to save time and to reuse.Review all websites and practice using the Interactivate Single Fraction Finder and the A Maths Dictionary. Watch the tutorials that I have created covering both of the websites. You can find the tutorials at <https://sites.google.com/site/walnutcreekstemlab/tutorials> |
| **Activities** | Day 1 Exploration  Learning outcomes for day 1: Students will begin to understand how numbers and pictures can be group in more than one way. Students will be able to collaborate within a group.   * Warm-up (this activity can be done on a different day or if you have extended time it can be incorporated into lesson 1.) * Break the class up into groups of 2 – 4 depending on your comfort level and needs. * Give each group an envelope of the category cards. Explain that they are going to sort/categorize the cards any way they want. However each group of cards must have at least 2 cards. When they finish sorting have the write down how they decided on the categories. They should write this on the index card and then flip the card over. Give students 10 – 15 minutes for this part of the exploration. * Next have the students walk around the room and see how other groups sorted their cards. Have them guess each groups categories and then flip over the index card to see if they were correct. Give students time to visit 2 or 3 groups. * Have students return to their original groups and pose the following questions:  1. Who can explain their categories? 2. Did you see other groups who had the same categories? 3. Why do you think other groups had different categories than your group? 4. Is there a way that all of the category cards could be part of one category?   Day 2 Lesson 1  SCOS 1.02  Learning outcomes for today: students should be able to use area or region models of fractions to explore part-whole relationships in context, represent fractions concretely and symbolically,  compare fractions using models, make different representations of the same fraction and combine fractions to describe parts of a whole   * Read 1 or more of the books from your read aloud choices. * As you read, discuss with students the meanings of the numerator and denominator, parts of a group, and parts of a whole.   + Stop and ask students:   + What does the bottom number of the fraction represent?   + When the number in the denominator is greater, what happens to each piece?   + Would you want ¼ or a cookie or ½? Why? * Demonstrate that dividing one item into smaller pieces (a chocolate bar, apple, or pizza) is looking at parts of a whole. Stress that the pieces must be equal in shape and size.   + Use a piece of construction paper and actually fold the paper for students to see.   + Give each student a piece of construction paper about the same size as a candy bar and have them fold the paper. * Demonstrate that fractions can also be used when looking at a group of items (colored candies, fruits in a fruit bowl, and students in the class). * Introduce formal vocabulary: Numerator, Denominator, Unit Fraction and Fractions. In lesson 2 the students will use computers to look up the definitions and record their findings in the computer lab.   + Use the white board to introduce the vocabulary.   + Write the word and a visual representation.   Day 3 Lesson 2  Learning outcomes for today: Students will be able to use specific terms when identifying numbers, fractions and their parts.   * Bring the students to the computer lab or if computer time is limited then use a computer and LCD projector in class. * Give each student a vocabulary sheet. * Have students navigate to <http://www.amathsdictionaryforkids.com/> As noted in the preparations this should be bookmarked under favorites. * Demonstrate how to use the dictionary. Have the students complete the worksheet. This should take 20 – 30 minutes. Be sure the students have time to explore the interactive parts of each definition. *Early finishers can use the dictionary to look up other math related words they are interested in learning more about.* * After the allotted time, be sure to go over the answers with the students. You could even put students in small groups to compare answers. Be sure they have the correct terminology.   Day 4 Lesson 3  SCoS 1.05 & 1.05a  Learning outcomes for today Use area or region models and set models of fractions to explore part-whole relationships. Students will also be able to represent fractions concretely and symbolically (halves, fourths, thirds, sixths, eighths).   * Bring the students to the computer lab or if computer time is limited then use a computer and projector in class. * Give each student a Single Fraction Finder sheet. * Have students open up <http://www.shodor.org/interactivate/activities/SingleFractionFinder/> * Demonstrate how to use the Interactivate. Have students work on the worksheet for about 30 minutes. It is ok if some students do not finish. The computer applet lets students know if the answer they give is correct or not. Students can make adjustments to their answers. ***(Each time students work through the interactive there are a variety of problems. Therefore there is not an answer key.)*** * Since the questions are generated randomly there is not a specific answer sheet for all students. The teacher can have students work in groups to compare answers for fractions that are the same and to discuss each other’s answers. The teacher can walk around to each group in order to clarify questions and discrepancies. * Collect the worksheets. Use the student’s responses to help plan for Day 5 Guided practice. This is critical. Look over the worksheets to find any common misconceptions. Use this data to help you focus the lesson for day 5. |
| **Assessment** | Guided practice and assessment   * Using the information from the student’s responses to Day 4’s activity, explain any misconceptions again. * Using individual white boards or a class white board, have students write down or draw pictures of the fractions: ¼, 3/6, ½, as you call out each fraction, give students about 30 seconds to record their answers. Then say “hold up your boards”, quickly scan the room for understanding.   + Note if you have not used individual whiteboards in this way before, a helpful hint is to focus on half the class each time. This will allow you to move through more questions. * Using a computer and projector bring up the following website <http://www.visualfractions.com/identify.htm>. Choose an activity to go over with the students. * Give out the student assessment **Create your own Fraction Book**. This may need to be finished the next day. Again this is open ended. Most students will use answers they learned in class or using the interactive. Higher level students may get creative and write answers that are less user friendly. EX: ½ = 34/68 or ¼ = 22/88. |
| **Critical Vocabulary** | **Concept/Vocabulary Word**  **Denominator:** the bottom number in a fraction that shows the total number of parts in a whole. In the fraction 1/3, 3 is the denominator.  **Fractions:** a number that names part of a whole or part of a set.  **Numerator:** The top number in a fraction that shows the number of equal parts counted.  In the fraction 1/3, 1 is the numerator.  **Unit fraction:** the fraction with a numerator of 1. |
| **Modifications** | * For advanced students who are able to master the activity before the end of class on day 4. Have them use <http://www.shodor.org/interactivate/activities/FractionSorter/>. With the accompanying worksheet. * **Khan Academy-** [Practice math at your own pace](http://www.khanacademy.org/exercisedashboard) with our adaptive assessment environment. You can **start at 1+1 and work your way into calculus** or jump right into whatever topic needs some brushing up.  Each problem is randomly generated, so you never run out of practice material. **If you need a hint, every single problem can be broken down, step-by-step, with one click.** If you need more help, you can always watch a related video.   The fraction resources begin @ <http://www.khanacademy.org/math/arithmetic/fractions/v/numerator-and-denominator-of-a-fraction> Students can watch and practice their skills at school or at home. |
| **Alternative Assessments** | * The provided assessment for this lesson encourages open ended answers from students. This may be difficult for some students. An alternative assessment is included for those students. The assessment tests the skills, but is not open ended. ***Permission for this worksheet is given by*** [***http://www.worksheetworks.com/***](http://www.worksheetworks.com/) ***for educational purposes only.*** |
| **Supplemental Information** | **Student Websites**  http://www.kidsolr.com/math/fractions.html  Great for students who finish early and are ready to move at their own pace.  http://www.bbc.co.uk/skillswise/numbers/fractiondecimalpercentage/fractions/introduction/index.shtml  Reinforcement of skills including: facts, games and quizzes.  http://www.khanacademy.org/math/arithmetic/fractions/v/numerator-and-denominator-of-a-fraction  Students can watch and practice their skills at school or at home.  **Teacher Websites**  http://www.math-drills.com/fractions.shtml  A variety of free worksheets for teachers to print and use with students  www.worksheetworks.com/  The premier web service for creating professional educational resources. Used by teachers and parents around the world |
| **Comments** | As a teacher it is important to understand how your students learn. This lesson should be adapted to fit your needs as well as your students. Each lesson can be used separately or you can complete the week long unit following the suggested time line.  Remember before you teach this or any other lesson you should pre-view all of the web-sites, software and worksheets. Being comfortable with the materials will allow for a higher quality of instruction and learning. |
| **Author Info** | My teaching background is quite diverse. I taught at a business school when I first graduated from college. Then after a few years I became a technology instructor for students and teachers. In order to be closer to home I began teaching 6th grade in the town that I lived. It was wonderful to be able to incorporate all of my technology skills into my 6th grade classes. After moving to NC I began teaching in Durham and then Wake County where I have been a 5th grade teacher for the past 3 years. While teaching 5th grade I was the Math Olympiad coach, since math is one of my favorite subjects. I am so thrilled to teach at Walnut Creek Elementary School. I am passionate about technology and now I get to teach it full-time again. I look forward to teaching students that the computer can be used for so much more than games. I am certified in math (6-9), elementary (k – 6) and academically gifted (k – 12)  My mentor Bob Panoff is the Executive Director at Shodor. Shodor was established in Durham, NC in 1994, Shodor is a nonprofit organization serving students and educators by providing materials and instruction relating to computational science (scientific, interactive computing).  With an Internet presence producing 3 to 4 million page views per month, Shodor has an international impact. Its [award-winning](http://www.shodor.org/about/best/), free online education tools such as [Interactivate](http://www.shodor.org/interactivate/) are popular with students and educators alike. |