**Introduction to Equivalent Fractions**

This lesson serves as an introduction to equivalent fractions. It addresses standards for both 3rd and 4th grade but can be used with a variety of age groups to support students’ foundational understanding of fractional equivalence. Here, students will use manipulatives, such as fraction strips, to visually compare fractions and determine equivalence. In addition, students will use pattern finding, structure, and repeated reasoning to begin developing strategies for comparing fractions, determining equivalence, and generating equivalent fractions.

**Standards:**

**Common Core State Standards:**

* **Mathematical Practices:**
  + **CCSS.Math.Practice.MP4** – Model with mathematics.
  + **CCSS.Math.Practice.MP5** – Use appropriate tools strategically.
  + **CCSS.Math.Practice.MP7** – Look for and make use of structure.
  + **CCSS.Math.Practice.MP8** – Look for an express regularity in repeated reasoning.
* **3rd Grade**
  + **CCSS.Math.Content.3.NF.A.3** –Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
    - **CCSS.Math.Content.3.NF.A.3.A** –Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
    - **CCSS.Math.Content.3.NF.A.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.
    - **CCSS.Math.Content.3.NF.A.3.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*.
    - **CCSS.Math.Content.3.NF.A.3.D** – aCompare 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.
* **4th Grade**
  + **CCSS.Math.Content.4.NF.A.1** – Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
  + **CCSS.Math.Content.4.NF.A.2 – a** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2*.

**Objectives:**

* Students will be able to define equivalence.
* Students will be able to use visuals, manipulatives, and their understanding of numbers to compare fractions and determine equivalence.
* Students will be able to use visuals, manipulatives, and their understanding of numbers to generate equivalent fractions.
* Students will be able to support their conjectures about fractional equivalence in writing.

**Lesson Duration:** approximately 45-65 minutes

**Materials:**

* The Building Blocks of Math series, specifically Fractions
* Scratch paper
* Pencils
* Discovering Equivalent Fractions Worksheet (1 per student)
* Fraction Manipulatives (1 per student)
  + Optional: Printable Fraction Strips
* Fraction Worksheets (1 set per student, depending on learning needs and abilities):
  + Lowest cognitive demand: The Swamp’s Strongest Lifters and River Bottom Surprises
  + Average cognitive demand: Over the Net and Swamp Flip-Flop
  + Highest cognitive demand: Lost! and Winter Olympic Trivia
* Optional: Equivalent Fractions Chart

**Requisite Prior Knowledge:**

* Before engaging in this lesson, students should have prior knowledge of comparing whole numbers using >, <, and = so they are prepared to use those same symbols to compare fractions.
* Students should also be familiar with the vocabulary terms fraction, numerator, and denominator. They should know that in a fraction that shows equal parts of a whole, the numerator shows how many equal parts there are and the denominator shows the total number of parts within one whole. For students still struggling with these concepts, please see the Fractions book, specifically pages 4 – 11.

**Vocabulary:**

* Numerator
* Denominator
* Fraction
* Equivalent

**Differentiation Considerations:**

* Opportunities for differentiation have been built into this lesson plan. For example, the differentiation strategy of choice is used in the Application Activity section of this lesson plan as students are allowed a choice of working independently or with a peer.
* You may choose to differentiate further in the Independent Application and Demonstration of Learning section of this lesson plan by assigning any of three leveled sets of independent practice to students with different learning needs:
  + For students who need more time and practice with the foundational ideas of equivalence, consider pulling a small group and using the Equivalent Fractions Chart to complete The Swamp’s Strongest Lifters and River Bottom Surprises.
  + For students who are working within their own Zone of Proximal Development (ZPD), considering having them complete Over the Net and Swamp Flip-Flop.
  + For students who need extension or enrichment, consider having them complete Lost! and Winter Olympic Trivia.

**Lesson and Instruction:**

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| **Lesson Components and Time Guidelines** | **Teacher Actions** |
| **Introduction/Hook**  Approximately 5-10 minutes | Begin with an open-ended question: Jonah ate 4/6 of his personal pizza. Molly ate 2/3 of her personal pizza. Who ate more pizza? How do you know?  Provide 3-4 minutes for students to engage in productive struggle with this problem. Encourage students to model the story situation with a picture to help them visualize.  Bring students back to the whole group setting and ask them what they noticed about their answers. Students should notice that both Jonah and Molly ate the same amount of pizza. Ask what this tells us about the fractions 4/6 and 2/3. Use this as an opportunity to introduce the word equivalent; Jonah and Molly ate the same amount, or an equivalent amount, of pizza. Equivalent fractions are those that represent the same amount out of a whole. |
| **Direct Instruction and Modeling**  Approximately 10-15 minutes | Elaborate on the idea of equivalence by explaining that even though two fractions may represent the same amount out of a whole, they can have completely different numerators and denominators.  One way to determine whether two fractions are equivalent is to compare them visually. Today we will use fraction manipulatives, such as fraction strips, to help us visually compare.  Model how to “line up” your fraction strips to compare two values. Use the following examples, or create your own:   * 1/2 and 4/8 🡪 1/2 = 4/8 * 1/3 and 5/10 🡪 1/3 < 5/10 (some students might recognize 5/10 as equivalent to 1/2, a useful strategy when comparing fractions with unlike denominators) * 6/8 and 7/12 🡪 6/8 > 7/12 (consider addressing any misconceptions here. Despite 7 being greater than 6, we are not simply comparing numerators and must consider the entire fraction. 6/8 represents a greater amount of one whole than 7/12.   Next, transition to generating equivalent fractions. Model how to find another fraction equivalent to 1/2 with your manipulatives. For example, consider 1/2 and the fraction strip broken into sixths, your new denominator. Line up the two strips and count the number of pieces needed to equal 1/2. That number becomes the new numerator of your equivalent fraction. We can show 1/2 = 3/6. Continue modeling how to generate equivalent fractions with the following:   * 3/4 (show 6/8 and 9/12 as equivalent) * 4/6 (show 2/3 and 8/12 as equivalent) * 1/5 (show 2/10 as equivalent)   Provide time for students to ask questions about equivalence and finding equivalent fractions before transitioning to the next phase of the lesson. |
| **Application Activity**  Approximately 15-20 minutes | Pass out copies of the Discovering Equivalent Fractions worksheet and review the instructions with students. Depending on your students’ level of independence, consider modeling the first few problems here before sending students to work either independently or in pairs.  Return to the whole group setting and review what students learned about equivalent fractions. Use the following prompts to facilitate a discussion focused on equivalent fractions, strategies for comparing, and any patterns students identified:   * What did you notice as you worked? * What patterns did you notice? * Look at some of the fractions equivalent to 1/2. What do you notice about their numerators and denominators? * Look at some of the fractions equivalent to 8/12. What do you notice about them? What connections can you make to the strategies of doubling and halving? * Think about the fraction manipulatives you have. Is it possible to show all of the possible fractions equivalent to 1/4 using those pieces? Why or why not? |
| **Independent Application and Demonstration of Learning**  Approximately 10-15 minutes | Have students transition to the independent work setting where they will apply what they know to complete an assignment about fraction equivalence and comparing fractions. Consider your students’ needs and assign independent work accordingly:   * For students who need more time and practice with the foundational ideas of equivalence, consider pulling a small group and using the Equivalent Fractions Chart to complete The Swamp’s Strongest Lifters and River Bottom Surprises. * For students who are working within their own Zone of Proximal Development (ZPD), considering having them complete Over the Net and Swamp Flip-Flop. * For students who need extension or enrichment, consider having them complete Lost! and Winter Olympic Trivia. |
| **Closure**  Approximately 5 minutes | Bring students back to the whole group setting. Explain that they spent time today working with manipulatives to determine equivalence and compare fraction sizes. Students also used the mathematical skills of looking for and making use of structure as well as expressing regularity in repeated reasoning to identify patterns within equivalent fractions. Some students even started coming up with their own strategies for finding equivalent fractions or comparing fractions without manipulatives!  Revisit the objectives by reviewing the idea that two fractions are equivalent if they represent the same amount, even if their numerators and denominators are different.  Consider allowing students to keep their manipulatives and/or their Equivalent Fractions Chart for use throughout the remainder of related lessons. |

**Next Steps and Reflection:**

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| What went well? |  |
| What changes might be beneficial? |  |
| Reteaching needs |  |
| Extension needs |  |