Lesson Plan for Fourth Grade Math - Determining the rule for finding equivalent fractions

For the lesson on February
At Prieto, Mr. Laughlin's class
Instructor: Jay Laughlin
Lesson plan developed by: Jay Laughlin, Drago Petrusic and Char Seiverling

1. Title of the Lesson: Determining the Rule for Finding Equivalent Fractions

2. Brief description of the lesson

In this problem, scholars are presented with a situation in which they need to figure out which of three classrooms is closest to their goal. Scholars will be given three fractions, along with a word problem to consider in order to answer key questions.

3. Goals of the Lesson:

a. Students will use a visual to find an equivalent fraction and then come up with a rule for finding equivalent fractions
b. Students will use prior knowledge to compare three fractions using like numerators and like denominators.
c. Students will use prior knowledge of division to determine how to section off a recycling bin.

4. Relationship of the Unit to the Standards

3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

- Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- 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.
- 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.*
- 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.

Examples:

⅓ > ⅛
6/10 < 3/10

This unit

4.NF.1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Examples:

6/8 = 18/24
6 * 3 = 18
8 * 3 = 24

5. Background and Rationale

Theme: To develop strategic problem solvers who persevere in finding solutions independently and with confidence.
Topic: Comparing Fractions - changed to Equivalent Fractions
Goal: SWBAT compare fractions with unlike denominators and numerators
New Goal: SWBAT discover a rule for finding equivalent fractions

Assumed Prior Knowledge:

- Know the denominator stands for the total equal parts in the whole (size of pieces)
- Know the numerator stands for the counted equal parts in the whole
- Know how to compare fractions with like numerators and like denominators
- Know how to find equivalent fractions using algorithm
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We want scholars to be informed decision makers.

- Wonder and ask questions by taking risks and being bold
- Collaborate to develop a systematic plan
- Gather and analyze data
- Reflect on misconceptions and learning discoveries

To develop strategic problem solvers that make sense of problems and persevere in solving them independently and with confidence.

6. Research and *Kyozaikenkyu*

We researched how fractions are presented in grades 3 through 5 through a variety of curricula. We focused on studying the problem solving approach that is used in *Connected Math* Grade 6, *Mathematics 5B for Elementary School* by Tokyo Shoseki, and *My Pals are Here* Maths 5A by Fong Ho Kuang. We also used our school based curriculum, Everyday Math for grades 4 and 5. After researching the sequence of introducing fraction concepts, we decided on an order that seemed to be the most reasonable for

teaching. From the common core, we realized that equivalent fractions is a concept that is the core of developing a sound understanding of fractions and their uses. In H. Wu's document "Teaching Fractions According to the Common Core Standards," it states "the fundamental fact about equivalent fractions ..., is its application to the comparison, addition, and subtraction of fractions, the meaning of multiplying a fraction by a whole number, and the introduction of (finite) decimals. The above-mentioned fundamental fact about equivalent fractions is the one theme that ties the various strands within fractions together."
Thus, we decided to build our lesson around equivalent fractions and introduce that concept prior to other relative concepts we'd be teaching (comparing, adding/subtracting, fraction of a whole, etc.).

Feedback from Colleagues:

Fractions of an hour are confusing. Combining time and fractions could be confusing.

Maybe use tickets and then taking a fraction of that whole. Or fraction of the population in the museum.

Use blank circles at onset instead of providing split up circles. Kids drawing equal parts on circles could be a challenge: kids take too long or kids do it poorly.
- Could give kids bag of circle pieces that kids have to use to create their own fractions
- Circles divided into halves, eights, thirds, etc. to compare
- Is this too much spoon feeding?
- There are mixed sized plastic pieces that could be used
- Could use rectangles to manipulate and create equal parts

They need to create and understand fraction pieces, but they might not be able to use fine motor skills to actually create the equal size parts. Hard to divide equally

How to ween students off of manipulatives. Need to place lesson after strong foundation in comparing fractions.

How can students learn to understand fractions as a number. Emphasize using number line instead of manipulatives.
- Fractions as a number on number line
- Fractions as a part of a whole

Our Extensive Research and Discussion:
We have decided to focus our lesson on finding a rule for equivalent fractions and possibly extending it to adding/subtracting fractions with unlike denominators.

7. About the Unit and the Lesson

The common core standards make it clear that being able to form equivalent fractions is the basis for developing a conceptual understanding of fractions. Our unit begins with students manipulating fractions through addition/subtraction and comparing. However, as we progress to using fractions with unlike denominators, students will discover that they need to find a way to find equivalent fractions so that they will be able to add/subtract or compare easily even if their initial fractions do not have the same total number of equal parts. The flow of the lesson will motivate students to seek a solution to this problem since they will be unable to advance their thinking without developing this rule.

Special Education /ELL Considerations:
Students will be grouped heterogeneously. Calculators and charts will be available to those students who need additional support with computation skills. Teacher will review fraction vocabulary, and key words and phrases will be highlighted prior to beginning activity.

Common Core Standard:
4.NF.1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

8. Flow of the Unit

Lesson	Learning objective(s)	# of lesson periods
1	SWBAT add and subtract fractions with like denominators.	1 - 60 min
2	SWBAT express fractions greater than 1 as improper and mixed numbers.	1 - 60 min
3	SWBAT compare fractions with like numerators and compare fractions with like denominators.	1 - 60 min
4	SWBAT recognize equivalent fractions (many names for the same fraction value).	2 - 50 min
5	*SWBAT discover a rule to find equivalent fractions.	1 - 60 min
6	SWBAT compare fractions with unlike denominators and unlike numerators	1 - 60 min
7	SWBAT add and subtract fractions with unlike denominators.	1 - 60 min

9. Flow of the Lesson

The sections of this lesson plan are just a guide. "Anticipated student responses," however, should always be included.

Steps, Learning Activities Teacher's Questions and Expected Student Reactions	Teacher's Support	Points of Evaluation
Review of different names for equivalent fractions. - What rule, or formula, can we discover to determine if fractions are equivalent?	This column shows additional moves, questions, or statements that the teacher may need to make to help students.	This column identifies what the teacher should look for to determine whether to proceed, and what observers should look for to determine the effectiveness of the lesson.
1. Introduction Do Now Questions: 1. What fraction is this? (show a square with 2 of 4 sections shaded) 2. Shade the square pizzas to show that you have eaten ½ of each whole pizza? (pizzas with halfs, fourths, eighths) 3. How many equal parts did you shade in each pizza? 4. What other fraction names can you use for each pizza? 5. What do you notice about the fraction names that you have written?	Walk through room to silently check on scholar work.	

2. Posing the Task Ultimate Goal: Work with your team to discover a rule for finding equivalent fractions. *Scholars receive sheet with equal size whole squares and different total number of equal parts. Students create their own equivalent fractions and label the fractions. Scholars come up with a rule that can be used to always find equivalent fractions. (removed)* Part 1: Mr. Petrusic's, Mr. Laughlin's, and Mrs. Seiverling's classes are in a recycling competition. Each class must fill a 48 gallon recycling bin that has been provided by Mrs. Laureano. Mr. Petrusic's class has filled 6/8 of its 48 gallon bin. Mrs. Seiverling's class has filled 3/4 of its 48 gallon bin. Mr. Laughlin's class has filled 18/24 of its 24 gallon bin. How can we compare the amount of recycling material collected by each class? Which class is in the lead? Which class is the farthest behind? How much recycling material have they collected all together? (bonus question) Allow students independent work time to try and solve the problem (question 1). Students will be provided with blank bin that has 48 dash marks so students can decide if and how they will use this to determine the amount of recycling material they have.~10 minutes. Teamwork time to discuss with tables potential solutions and reasons/explanations why these solutions make sense. ~ 10 minutes. Teams should record initial answers based on their independent work and team work. Part 2: Now, you have no visual representations of the bins! Use what you have created to find a rule for identifying equivalent fractions. Two weeks have passed and Mrs. Seiverling's class has ⅝ of the bin full, Mr. Laughlin's class has 10/12 of a bin full, and Mr. Petrusic's class has 20/24 of a bin full. How many gallons has each class collected at this point in the year? Who will Mrs.	*Students could draw pictures of recycle bins and shade the fraction filled. Bins will be marked with 48 dash marks so students can create equal parts to shade the given fraction for their "class".* *Students should come to the conclusion that they can't compare the fractions adequately because they have different total equal parts in the whole (denominators) and different number of counted equal parts (numerator).* *Ask students, is there some way that we can create a situation where the number of counted equal parts (denominator) is the same so we can compare numerators that are the same size?*	*How do we know if students understand the task?* Task instructions will be on board. T will ask S to repeat directions before they begin to clarify understanding and answer any additional questions. T will circulate between groups to informally monitor S progress with task.

Laureano be most proud of and why?		
3. Anticipated Student Responses *S: 18/24 is the biggest because it has the largest number of counted parts. ¾ is the biggest because it is only missing 1 part from being whole.* S: Fill in the bin with the number of shaded parts as the number in the numerator. Students may have difficulty converting from one fraction with a given denominator to another that has 48 as the denominator.	T: Ask students to refer to what we learned about comparing fractions - denominators need to be the same to directly compare values, or numerators need to be the same to compare size of the parts. T: Ask students how many total equal parts are in the whole when that many parts are counted? Refer to how students should read and interpret the fraction as "out of 4 total parts, 3 are full". Encourage students to refer back to the equivalent fractions they identified in part one of the task. They should use the numerical fractions to determine a pattern of finding equivalent fractions.	

4. Comparing and Discussing *This section may identify which student solution methods should be shared and in what order, or generally how to handle the discussion.* Sharing HOW we know that the fractions written are equivalent (they have the same part of the whole square shaded). They also can see visually they are the same amount. Sharing arithmetic strategy to move between different names for equivalent fractions (could be adding, multiplying). Students can share how their strategy can be used to identify equivalent fractions.	*What are the ideas to focus on during the discussion?* Scholars discussing a rule that works every time to find an equivalent fraction. Ask: Why does this rule work? (because when you increase the number of total equal parts by x, you are also increasing the number of counted parts by x (multiplication); when you decrease the number of total equal parts by x, you are also decreasing the number of counted parts by x (division). When you mult/div the n and d by the same number, that number represents "1." Why do we even need to worry about finding equivalent fractions? (to share candy equally if more people come over and want some; because the whole can always change - it can be a bag of chips, an amount of money, books in a library, video games we own)	*What will indicate that students are benefiting from the discussion?* Adding more information or notes to their work. Changing or fixing answers after discussing with peers. Students can prove that the rule to find equivalent fractions works by using the provided fraction cards. Students have practice using their fraction cards to check with the simplified fraction card and any other equivalent fraction.
(*If needed, repeat 2, 3, & 4 above for additional tasks.)*		

5. Summing up *This section may describe how the teacher will summarize the main ideas of the lesson. It may also include an assessment activity.* You have discovered a rule to find equivalent fractions! This is the core of understanding how to use and understand fractions! We will further explore how this rule can help us understand the world of fractions that is all around us! Part I: Scholars must find 2 equivalent fractions for *2/6*. Explain HOW you know the fractions are all equivalent. Part II Challenge Exit Slip Assessment: instruct the students to explain what rule we have discovered today and how we know that this rule works. Encourage word description, pictures, and example problems.		

10. Evaluation

This section often includes questions that the planning team hopes to explore through this lesson and the post-lesson discussion.

Were students able to correctly divide the space in the bin based on the fraction they were representing? If not, how was the teacher able to appropriately support the struggling student(s).

Were students able to find relationships between the original fraction and the new fraction?

11. Board Plan

This section contains a diagram showing how work on the blackboard will be organized.