Grade 5 Fraction Equivalency

5.N.7	
Demonstrate an understanding of fractions by using concrete and pictorial representations to • create sets of equivalent fractions • compare fractions with like and unlike denominators	1. Create a set of equivalent fractions and explain why there are many equivalent fractions for any given fraction using concrete materials. 2. Model and explain that equivalent fractions represent the same quantity. 3. Determine if two fractions are equivalent using concrete materials or pictorial representations. 4. Formulate and verify a rule for developing a set of equivalent fractions. 5. Identify equivalent fractions for a fraction. 6. Compare two fractions with unlike denominators by creating equivalent fractions. 7. Position a set of fractions with like and unlike denominators on a number line, and explain strategies used to determine the order.

Clarification of the outcome:

- ✦ This outcome concerns understanding that a fraction can have more than one name.
- ✦ The idea is important to understanding fractions. Note that reducing is not a requirement of mathematics. It is "house keeping" that sometimes is useful when working with fractions. "Fattening", the reverse of reducing, is at least as useful as reducing.

Required close-to-at-hand prior knowledge:

- ✤ Understand the part of a whole, part of a set/group, and measure (name for a point on a number line) meanings of fraction.
- ✤ Understand that when two fractions have the same denominator (bottom), the numerator (top) that is larger indicates the larger fraction.

SET SCENE stage

Ask students for situations where there are different names for the same thing. Some might provide such situations as: nicknames, 5- 2 is also 2 + 1, etc. Tell them that fractions can have different names for the same value and that they are going to play a game about that.

The problem task to present to students:

Organize students into groups of about 4.

Provide each group with a sheet that contains five sets with 4 fractions per set. The sets are:

SET 1	1/2	5/10	6/11	3/6
SET 2	1/3	5/16	2/6	3/9
SET 3	780/416	30/16	886/274	990/528
SET 4	1596/2268	57/81	1197/1701	54/44
SET 5	2340/585	3213/584	60/15	1200/300

Three of the four fractions in each set name the same fraction. One of them does not. [It is not equivalent to the other three.] The task for each group is to identify, by circling it, the fraction that does not belong in each set because it does not name the same fraction. Tell them that they can use any method they want to try to figure out the fraction that does not belong and that the group that identifies the most does-not-belong fractions correctly wins a prize.

NOTE:

For your information, the non-equivalent fraction in each set is encased in a thicker border.

Comments:

It may seem that the problem task is putting the proverbial cart before the horse. It sort of is, but students are not expected to identify the fractions in any sophisticated or procedural way. They can use any approach, including guessing. The point of the game is to stimulate thinking about equivalency. The lesson that follows will develop understanding of equivalency and an efficient procedure for determining it. For the moment, students have been given a challenge.

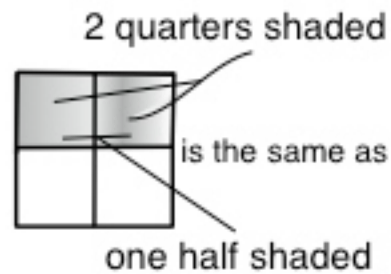
DEVELOP stage

Activity 1: Revisits SET SCENE and addresses achievement indicators 2, 3, and 5.

Announce the does-not-belong fraction for each set. Handout the prize to the winning group (groups, if a tie occurs).

Tell students that they will replay the game later but first they need to learn a lot about fractions that name the same fraction. Tell them that such fractions are known as equivalent fractions.

- ✦ Present students with a problem such as: "*Two friends were arguing about door prize that each of them had received at a school fund raising event. Joe received 1/2 of a rectangular-shaped chocolate cake. Mary received 2/4 of the same kind of chocolate cake. Joe insisted that Mary received more cake than him. Mary insisted that each of them received the same amount of cake. Who is correct?*" Ask students to settle the argument by drawing two same-sized rectangles and shading the fraction 1/2 in one of them and the fraction 2/4 in the other. Discuss. Ensure that they realize that 1/2 of a rectangle shaded is the same as 2/4 of the same-sized rectangle shaded.



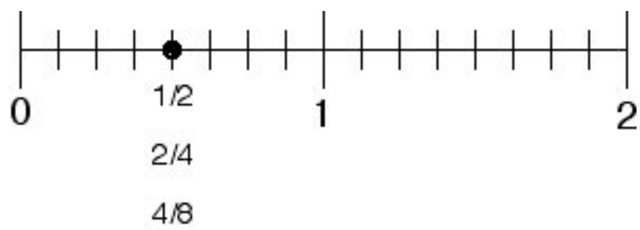
- ✦ Ask students to colour a fraction strip and a fraction circle to represent 4/4. Ask them to explain why the strip and circle also represents 1. Discuss 4/4 and 1 as equivalent in value even though the two numbers look different. Relate the situation to '2 + 2' and '5 - 1' being equivalent in value even though the number sentences look different. Relate the situation to 1 dime and 2 nickels being equivalent in value even though the coins look different.

Activity 2: Addresses achievement indicators 1, 2, 3, and 5.

- ✦ Ask students to represent 1/2, 2/4, and 4/8 by folding a rectangular strip of paper. Ask them to explain why 1/2, 2/4, and 4/8 are equivalent fractions.
- ✦ Ask students to represent 1/2, 2/4, and 4/8 by folding a circular piece of paper. Ask them to explain why 1/2, 2/4, and 4/8 are equivalent fractions.
- ✦ Ask students to show with paper folding why 1/2 and 3/6 are equivalent fractions. Ask students to show with paper folding why 1/4 and 3/12 are equivalent fractions.

Activity 3: Addresses achievement indicators 1, 2, 3, and 5.

- Ask students to represent 1/2, 2/4, and 4/8 by subdividing the 0 to 1 section of a number line going from 0 to 2 (see diagram). Ask students to explain why 1/2, 2/4, and 4/8 are equivalent fractions. [**Note this concerns the measurement meaning of fraction.**]



- Have students explain why 3/4 and 6/8 are equivalent fractions using a number line.

Activity 4: Addresses achievement indicators 1, 2, 3, and 5 & practice.

- Ask students to list three fractions equivalent to 1/2 and three fractions equivalent to 1/3. Have them explain their reasoning using fraction bars or number lines.
- Ask students to explain why 50/100 and 1/2 are equivalent fractions using a hundred grids and to explain why 1/10 and 10/100 re equivalent fractions using a hundred grids.

Activity 5: Addresses achievement indicators 3 and 4.

- Present students with the fraction 2/3. Have students determine and justify a method (by making use of rectangles and/or number lines) for creating a fraction equivalent to 2/3. Repeat for two other relatively prime fractions (cannot reduce) such as 4/5 and 3/8. Ensure students determine a method involving the multiplication of the numerator and denominator by the same number. [**Note**: This multiplication strategy could called "fattening". It is far more useful for working with fractions than is reducing.]
- Present students with the fraction 6/10. Have students determine and justify a method (by making use of rectangles and/or number lines) for creating a fraction equivalent to 6/10 for which the top and bottom numbers are "smaller". Repeat for two other reducible fractions such as 6/8 and 9/12. Ensure students determine a method involving the division of the numerator and denominator by the same number. [**Note**: The division strategy is what you know as reducing.]
- Discuss how the multiply/divide method for making fractions equivalent might have been helpful in the game students played.

Activity 6: Addresses achievement indicators 1 and 6 & practice.

Organize students into groups. Present half the groups with a relatively prime fraction such as 3/5. Present the remaining groups with a large reducible fraction such as 60/100. Ask the groups to make a list of 3 fractions that are equivalent to the given fraction. Encourage them to use the methods developed in activity 5. Have selected groups present their lists and explain the method for making equivalent fractions.

Activity 7: Addresses achievement indicators 2, 3, 4 ,5 and 6.

Organize students into groups. Ask them to compare 7/12 and 3/4 as to bigger/smaller. Allow groups to use concrete materials if desired. Have each group present their decision and explanation for it. Discuss the matter. Lead students to realize that the strategy of making both fractions have the same denominator (thus creating an equivalent fraction for each given fraction) makes it simple to compare fractions. Repeat the activity for the fraction pairs 9/15 & 2/3, 7/10 & 4/5, and 2/3 & 3/4.

Activity 8: Addresses achievement indicators 5, 6, and 7.

Organize students into groups. Present the groups with a list of 5 fractions having like and unlike denominators (e.g. 1/2, 3/10, 3/4, 5/10, 2/3). Ask the groups to position the given fractions on a number line and to explain their decisions. Ask selected groups to present their solutions. Discuss.

Activity 9: Addresses achievement indicator 5.

Ask students to replay the game from SET SCENE. Encourage them to use calculators and the multiplication/division method they learned for making fractions equivalent.

[Five sets of fractions to use are provided below.]

Announce the does-not-belong fraction for each set. Handout the prize to the winning group (groups, if a tie occurs). Hopefully there will be many winning groups this time.

SET 1	1/4	10/40	5/20	6/30
SET 2	2/5	10/60	6/15	26/65
SET 3	3675/3626	75/74	2475/2442	3081/5342
SET 4	3303/1628	2520/2680	693/737	63/67
SET 5	3720/1120	3213/584	122/26	93/28

NOTE:

For your information, the non-equivalent fraction in each set is encased in a thicker border.

Activity 10: Assessment of teaching.

- ✦ Ask students to list two fractions equivalent to 2/5 using the multiplication/division method. Ask them to explain why one of the listed fractions is equivalent to 2/5 by using a rectangle diagram or a number line.
- ✦ Ask students to compare 6/8 and 14/20 as to bigger/smaller. Have them explain their thinking.

If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).

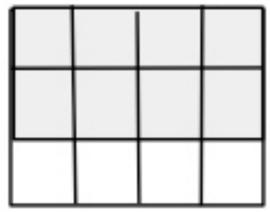
Two examples of partially well-designed worksheets follow.

Each worksheet contains a sampling of question types. More questions of each type are needed for a well-designed worksheet.

The MAINTAIN stage follows the sample worksheets.

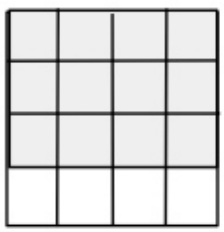
Question 1.

Use the rectangle diagram to help you write an equivalent fraction.



8/12 =   /

Question 2.

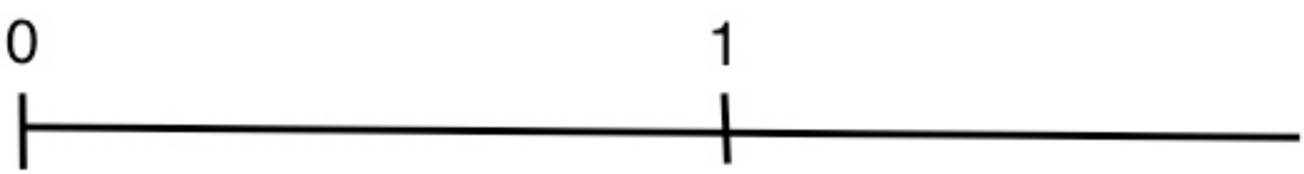


Write four equivalent fractions for the amount shaded.

_______ _______ _______ _______

Question 3.

Show why the fractions 3/5 and 6/10 are equivalent using a number line.



Question 4.

List three equivalent fractions for 100/300. The tops and bottoms of the three equivalent fractions should be smaller than 100 and 300. Show your work.

Question 5.

List three equivalent fractions for 7/8. Show your work.

Question 6.

To show that $\frac{3}{4}$ is equivalent to $\frac{9}{12}$, Brian makes a model of $\frac{9}{12}$ using blocks.

Step 1: 

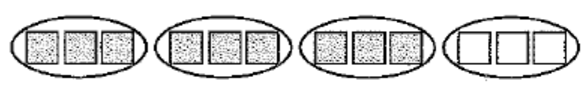
Brian makes a model of the original fraction $\frac{3}{4}$.

(He leaves a space between the blocks.)

Step 2: 

Step 3: 

He adds blocks until he has placed 12 blocks.

From Step 3, Brian can see $\frac{3}{4}$ is equivalent to $\frac{9}{12}$: 

Use his method to show that 2/3 is equivalent to 8/12.

MAINTAIN stage

Mini-task example

Every so often:

- Present a fraction and ask students to list two fractions equivalent to it and to describe how they determined the two fractions.
- Present two equivalent fractions (e.g. 3/4 and 15/20). Ask students to explain why the two fractions are equivalent.
- Present two NON-equivalent fractions. Ask students to decide if the two fractions are equivalent and to explain their thinking.
- Present two fractions (e.g. 10/32 and 3/4). Ask students to determine the larger fraction by making the denominators the same.

Rich-task example

Have students change a list of five fractions whose denominators are factors of 100 (e. g. 1/2, 2/5, 3/20, 4/25, 3/50) into equivalent fractions having denominators of 100. Ask students to order the fractions from smallest to largest. Ask students to select two fractions that are next to each other in the list and to determine a fraction that would be in between the two selected fractions.

Comments

This is a rich-task because of the numerical complexity and the ordering component and insertion task.