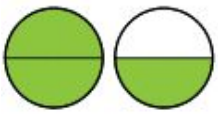
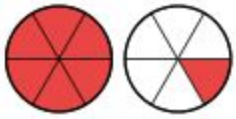
Exploring Equivalence with Rational Numbers: Part 2





Extending to Improper Fractions

<table>
<tr><td></td><td colspan="2">TARGET GROUP(S): 4th Grade, 5th and 6th Grade Support</td></tr>
<tr><td rowspan="4">PRE-PLANNING</td><td colspan="2">PRIOR KNOWLEDGE
This activity should <u>follow</u> the activity “Exploring Equivalence with Rational Numbers: Part 1
Fractions less than or equal to 1” as it extends students’ understandings to include quantities greater than 1 (e.g. improper fractions).

Students should understand that...
● Fractions can be represented through a variety of different representations including circle and rectangle models.
● There are quantities that are less than 1 and can be represented by a fraction whose numerator is less than the denominator.
● There are quantities that are greater than 1 and can be represented by improper fractions and/or mixed numbers.
● The numerator and denominator have specific meanings and are represented in models as the number of shaded pieces and the total number of pieces respectively.
● Equivalent fractions are fractions that represent the same amount and can have different numerators and denominators.

If students do not have a solid understanding of the concepts above or struggled with Part 1, you might consider beginning with some activities with the “Intro to Fractions” sim (https://phet.colorado.edu/en/simulation/fractions-intro) or spending more time with Levels 1 and 2 in the “Fraction Matcher” sim (https://phet.colorado.edu/en/simulation/fraction-matcher)</td></tr>
<tr><td colspan="2">LEARNING GOALS
● Develop strategies for determining which representations of mixed numbers and improper fractions are equivalent.</td></tr>
<tr><td>Common Core Standards</td><td>Common Core Practices</td></tr>
<tr><td>Identify and generate simple equivalent fractions. Explain why the fractions are equivalent. (CCSS: 3.NF.3b)

Different models and representations can be used to compare fractional parts.
a. Use ideas of fraction equivalence and ordering to: (CCSS: 4.NF)
i. Explain equivalence of fractions using drawings and models.</td><td>1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively (e.g. can go back and forth between visual models and formal fraction notation)
5. Use appropriate tools strategically
7. Look for and make use of structure</td></tr>
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<tr><td></td><td colspan="2">ii. Use the principle of fraction equivalence to recognize and generate equivalent fractions. (CCSS: 4.NF.1)</td></tr>
<tr><td></td><td colspan="2">MATERIALS</td></tr>
<tr><td></td><td colspan="2">● PhET Fraction Matcher simulation: https://phet.colorado.edu/en/simulation/fraction-matcher
● Computers/tablets for each student
● “Exploring Equivalence with Rational Numbers: Part 2 Extending to improper fractions” Activity Sheet for each student.</td></tr>
<tr><td rowspan="5">LESSON CYCLE</td><td colspan="2">WARM-UP</td></tr>
<tr><td colspan="2">Activate prior knowledge by having students journal about the following questions and then leading a whole class discussion in which they share their ideas.
1. Write down some examples of improper fractions.
2. Write down some examples of mixed numbers.
3. Can improper fractions and mixed numbers be equivalent? Explain.</td></tr>
<tr><td colspan="2">INTRO</td></tr>
<tr><td>Teacher will…
● Distribute the activity sheets.
● Point out that students should begin by investigating Level 3 only and answer question #1 in which they will look for similarities and differences between Level 3 and Levels 1 and 2. Make sure they know to discuss their observations with their partner.
● After giving students time to explore Level 3, lead a whole class discussion about Question #1. Have students discuss some things that are 1) similar between the levels and 2) different between the levels 1,2 and 3.</td><td>Students will…
Explore Level 3 of the Fractions screen

Write down their answers to Question #1 on the activity sheet and discuss with a partner.

Participate in a whole class discussion about question #1.</td></tr>
<tr><td colspan="2">GUIDED EXPLORATION</td></tr>
<tr><td>Teacher will…
● Review questions #2 through #7. Point out that before actually playing Level 3 students should first answer Question #2 and then discuss their answers with their partner.
● Clarify any questions students may have about all of the questions and check that they understand the directions before letting them work independently.
● Ask students to begin working.
● As students work, circulate around the room to make sure they answer Question #2 and pair-share before they play Level 3.
● Lead a discussion about Question #2a and #2b once most students have finished Question #2 and are ready to play or already playing Level 3. During the discussion, project the table for #2a and have students</td><td>Students will…
Open the Level 3 screen and complete question #2 before playing Level 2.

Before playing Level 3, discuss and compare answers for Question #2 with their partner.

Play Level 3 and try to get 10 out of 12 points before moving ahead.

Once they achieve 10 out of 12 points on Level 3, student should go on to answer questions #4-7.</td></tr>
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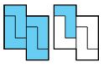
LESSON CYCLE (cont)	draw/describe a variety of representations for each fraction. Consider keeping this table with students' representations for later use in the "Discussion" phase of the lesson. ● As they play Level 3, **be available** for questions and/or ask questions, such as: *If students are struggling...* 1. How many pieces are shaded? Which part of the fraction is that? (Is that number the numerator or the denominator?) 2. How does the picture show the denominator? 3. How is a number different if the numerator is bigger than the denominator? 4. What is another way that fraction can be written? (e.g. as a mixed number) 5. How can we write improper fractions as mixed numbers? 6. How can you know if two fractions are equivalent? *If students need extensions...* 7. Was there a different equivalent representation you could have chosen for that fraction?	**If students finish early**, you might suggest that they try to get 12 out of 12 on every level up to Level 8.
	DISCUSSION	
	Teacher will... ● **Prepare the class** for a summary discussion of the big ideas: 1. Equivalent fractions are fractions that represent the same amount and can have different numerators and denominators. 2. Equivalent fractions are those fractions whose numerator and denominator are in the same ratio as that of the original fraction. ● **Remind** students to close their laptops or turn around so that the sim does not distract them from listening. Use an established teaching strategy such as popcorn discussion (one student answers, calls on the next	*Students will...* **Participate** in the whole class summary discussion.

LESSON CYCLE (cont)	student to talk), think-pair-share (pose question, allow time to think, turn and talk to partner), or group discussions (print out questions and have groups talk to each other and write down consensus to share aloud with class). ● **Begin** by discussing students' answers to Question #2c. As a reference for the discussion, consider having a student or group of students display their work for Question #2c using a document camera. Questions might include: 1. In question #2, were there some representations that confused you? What are they? What is confusing about them for you? 2. Did anyone think about the improper fractions as mixed numbers in order to match equivalent fractions? Explain. 3. How could we explain that $\frac{5}{4}$ is equivalent to  ? a. Can you explain how they are equivalent by using mixed numbers? b. Why is the denominator 4 and not 8 in the picture? ((i.e. the picture shows 8 pieces) 4. What are some other fractions and/or visual representations that are equivalent to $\frac{5}{4}$ (ask several students and generate a long list to include fractions that don't appear in the sim). 5. How is "seeing" the denominator in the pictures the same or different for fractions less than or equal to one and fractions greater than 1? 6. What are some fractions that are equivalent to $\frac{7}{3}$? (make a long list). What relationships between	

<table>
<tr><td rowspan="4">LESSON CYCLE
(cont)</td><td>the numerator and denominator are we using to make this list? (start the discussion with this question if you feel students can jump right to it)
7. How many different ways can we write $\frac{7}{3}$ using equivalent fractions?
● Continue the discussion by having students share their answers to #4,5,6,7</td><td></td></tr>
<tr><td colspan="2">SUMMARY</td></tr>
<tr><td>The teacher will...
● Summarize the discussion by asking more general questions such as:
1. What questions do you still have?
2. Did anyone not answer another question? Share out and call on someone who can answer it.
3. Who can explain how they know when fractions are equivalent?
4. What is your strategy for writing equivalent fractions? For example, if I ask you to write fractions equivalent to ⅘, how would you do it?</td><td>The student will...
● Participate in the summary discussion.</td></tr>
<tr><td colspan="2">EXIT TICKET</td></tr>
<tr><td>The teacher will...
● Ask students to draw at least two different fraction representations (that are greater than 1) that are equivalent to each other and label each representation with the fraction it represents.
● Alternatively, you might choose to specify a specific fraction and/or mixed number and ask students to draw and label two or more representations of fractions that are equivalent to the given fraction.</td><td>The student will...
● Complete and hand in the exit ticket.</td></tr>
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