

Teacher Guide: Fractions Greater than One



Learning Objectives

Students will...

- Add fractions with like denominators.
- Understand the meaning of a fraction with a numerator greater than its denominator.
- Convert from improper fraction to mixed number, and vice versa.
- Add fractions with unlike denominators using the least common denominator (LCD).
- Express the sum of fractions as an improper fraction and a mixed number.



Vocabulary

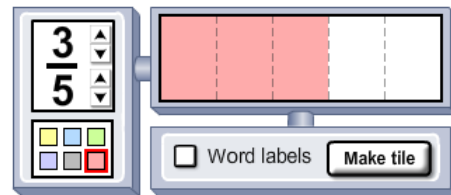
equivalent, fraction, improper fraction, least common denominator, mixed number



Lesson Overview

The *Fractions Greater than One* Gizmo™ can be a follow-up to the *Equivalent Fractions* Gizmo and the *Adding Fractions* Gizmo. This Gizmo allows students to explore improper fractions and mixed numbers using fraction tiles. Students can make fraction tiles by setting the numerator and denominator (up to 12) and clicking **Make tile**.

Fraction tiles can be placed on two number lines to model sums of fractions. Sums are shown as improper fractions on the top number line and mixed numbers on the bottom.



The Student Exploration sheet contains two activities:

- Activity A – Students are introduced to improper fractions, and learn to convert from improper fractions to mixed numbers and vice versa.
- Activity B – Students add fractions with unlike denominators, expressing the sums as improper fractions and mixed numbers.



Suggested Lesson Sequence

1. Pre-Gizmo activity (🕒 10 – 20 minutes)

Improper fractions and mixed numbers arise when you add fractions and the sum exceeds 1. Adding fractions with unlike denominators requires finding equivalent fractions. As such, it is important that students understand fraction addition and equivalent fractions before attempting this Gizmo.

Use the Gizmo and a projector to reinforce these concepts. Here are some examples:

- Use the Gizmo to illustrate why, for example, $\frac{1}{5} + \frac{1}{5} = \frac{2}{5}$. (Try **Word labels**.)
- Illustrate why, for example, $\frac{1}{2}$ is equivalent to $\frac{4}{8}$.

(See the **Selected Web Resources** on page 3 for links to the *Equivalent Fractions* and *Adding Fractions* Gizmos.)

2. **Prior to using the Gizmo** (🕒 10 – 15 minutes)
Before students are at the computers, pass out the Student Exploration sheets and ask students to complete the Prior Knowledge Questions. Discuss student answers as a class. At this point, letting students share how they thought about the questions is more valuable than “going over” the correct answers. After the discussion, if possible, use a projector to introduce the Gizmo and demonstrate its basic operations.

3. **Gizmo activity** (🕒 15 – 20 minutes per activity)
Assign students to computers. Students can work individually or in small groups. Have students work part of the Student Exploration sheet using the Gizmo. Alternatively, you can use a projector and do the Exploration as a teacher-led activity.

It may be overwhelming for students to do all of the activities in the Student Exploration in one sitting. We recommend starting with the first page of the Student Exploration sheet (Prior Knowledge Questions and Gizmo Warm-up) and working through the activities in order. Extend the lesson if you want using the extensions below. Return to the Gizmo and the unused activities in future class periods to reinforce the concepts.

4. **Extending the Gizmo** (🕒 15 – 20 minutes each)
Here are some suggestions for extending the activities in the Student Exploration sheet:

Activity A Extension – Here is a word problem to try. Suppose that a bunch of kids have a pizza party. All pizzas are cut into 8 pieces, so each piece is $\frac{1}{8}$ of the pizza. If each kid plans to eat $\frac{3}{8}$ of a pizza, and there will be 10 kids coming to the party, how many pizzas should they order? How much pizza will be leftover? [Add or multiply to get a total of $\frac{30}{8}$ pizzas eaten. Convert to mixed number: $\frac{30}{8} = \frac{24}{8} + \frac{6}{8} = 3\frac{6}{8}$ pizzas. So 3 pizzas will be eaten, plus $\frac{6}{8}$ (or $\frac{3}{4}$) of another. If they order 4 pizzas, they’ll have $\frac{2}{8}$ (or $\frac{1}{4}$) of a pizza, or 2 pieces, leftover.]

Activity B Extension – Here is a sample problem from the world of baking to give your students. Theo is making cake, cookies, and brownies for a party. The cookies require $\frac{1}{2}$ cup of sugar. Brownies need $\frac{2}{3}$ cup of sugar. Cake needs $1\frac{1}{4}$ cup sugar. What is the total amount of sugar that Theo needs? [Answer: $2\frac{5}{12}$ cups. Model in the Gizmo to see.]

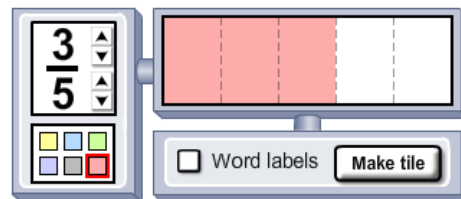
5. **Follow-up activity** (🕒 20 – 30 minutes)
For extended practice, make sure your students can handle some problems that this Gizmo cannot display. For example, try problems in which the sums are greater than 3. Can students convert $\frac{74}{11}$ to a mixed number, for example? [Answer: $6\frac{8}{11}$.] Point out that fractions are just division. For example, in this case, $74 \div 11 = 6\text{ R}8$.



Mathematical Background

The *denominator* of a fraction describes how many equal pieces the whole is chopped into. For the fraction $\frac{3}{5}$, the whole has been chopped into 5 pieces.

The *numerator* indicates how many of those pieces the fraction refers to. So, $\frac{3}{5}$ means that 3 out of the 5 equal pieces are, in this case, shaded red.



When the numerator and denominator are equal, you have one whole, or 1.

But what about fractions in which the numerator is *greater than* the denominator, such as $\frac{8}{5}$?

Fractions such as these are greater than 1 and are often called *improper fractions*. (Some also call these *top-heavy fractions*.) There is nothing wrong or “improper” about improper fractions; they’re just greater than 1. Be sure your students know that they are not to be avoided.

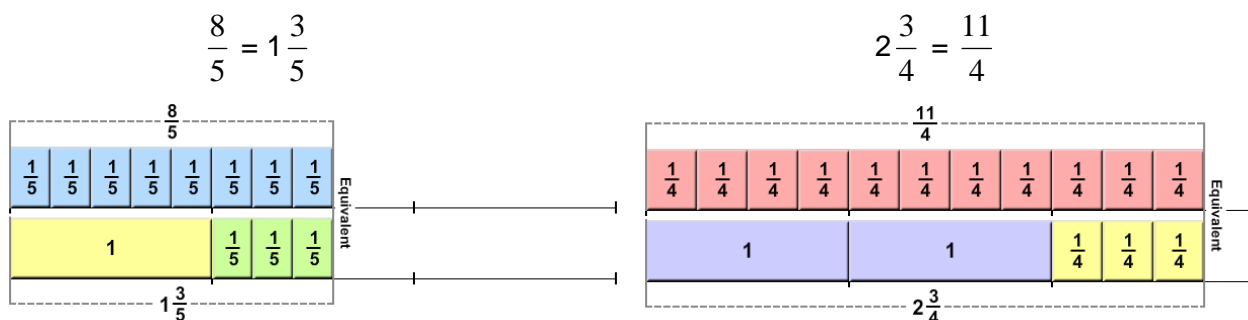
Another way to express a fraction greater than 1 is as a *mixed number*. A mixed number is written as a whole number plus a fraction less than 1.

Students should be able to convert an improper fraction to an equivalent mixed number, and vice versa. Here is one example of each:

$$\frac{8}{5} = \frac{5}{5} + \frac{3}{5}. \text{ The fraction } \frac{5}{5} = 1, \text{ so } \frac{8}{5} = 1 + \frac{3}{5}, \text{ or, more commonly, } \frac{8}{5} = 1\frac{3}{5}.$$

$$2\frac{3}{4} = 2 + \frac{3}{4} = \frac{8}{4} + \frac{3}{4} = \frac{11}{4}. \text{ So, } 2\frac{3}{4} = \frac{11}{4}.$$

The Gizmo illustrates these concepts nicely. (Note the use of the **Show sums** checkbox.)



Selected Web Resources

Equivalent Fractions Gizmo: <http://www.explorelarning.com/gizmo/id?1012>

Adding Fractions Gizmo: <http://www.explorelarning.com/gizmo/id?1027>

Improper Fractions and Mixed Numbers Gizmo: <http://www.explorelarning.com/gizmo/id?252>

Improper fractions information: <http://www.mathsisfun.com/improper-fractions.html>

Improper fractions to mixed numbers: <http://library.thinkquest.org/J002328F/impmix.htm>