

## Teacher Guide: Fraction Artist 2



### Learning Objectives

Students will...

- Understand that a fraction represents a relationship between a part and the whole.
- Understand that the denominator of a fraction represents the number of equal parts the whole has been divided into.
- Understand that the numerator of a fraction is the number of parts being referred to.
- Compare the sizes of different fractions.
- Develop an understanding of equivalent fractions.



### Vocabulary

denominator, fraction, numerator



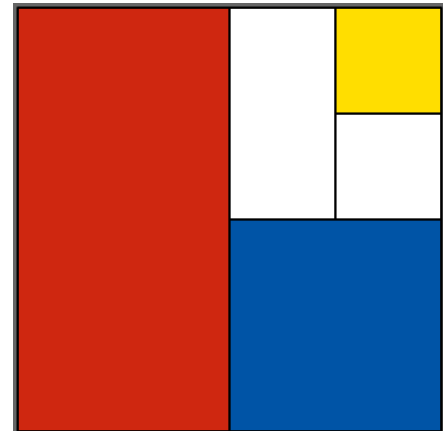
### Lesson Overview

The *Fraction Artist 2* Gizmo™ helps students deepen and develop their understanding of fractions. Ideally, students should have used area models of fractions before. The *Fraction Artist 1* Gizmo provides a nice introduction to this. (See **Selected Web Resources** on page 3 for the link.)

In *Fraction Artist 2*, students create modern-art-style paintings by dividing and coloring a square canvas. They then study the fractional sizes of their paintings' sections.

The Student Exploration sheet contains three activities:

- Activity A – Students create a painting with unequal-sized sections and identify the fractional size of each.
- Activity B – Students create paintings to explore the relationship between a fraction and another fraction twice its size.
- Activity C – Students explore different ways to make paintings that are one-half blue.



### Suggested Lesson Sequence

1. **Pre-Gizmo activity** (🕒 10 – 15 minutes)  
Introduce students to the life and work of artist Piet Mondrian. (See *Selected Web Resources* for helpful links.) Ask them for their reactions to his art and then have them describe any mathematics they see in his paintings.
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 would probably 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) plus one of the three activities. 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)  
Here are some suggestions for extending the activities in the Student Exploration sheet:

Activity A Extension – Have students make paintings using the Gizmo and then switch computers with a partner. The students must find how much of their partners' paintings are covered by each section – first without using the Gizmo, and then using the Gizmo to check their answers. (This could also be done by using the snapshot feature, pasting the snapshots into a word-processing document, and then printing. Students could then write on the printed paintings to show how they determined the value of its sections.)

Activity B Extension – Repeat the activity in the Student Exploration with a different set of rules. For example, you could require that the blue section be three times as big as the red section and that the red section be three times as big as the yellow section.

Activity C Extension – Have students create paintings for a “Happy Half Art Gallery.” Like in the activity, have them make paintings that are one-half blue, but allow them to use as many sections as they want. Suggest that students make the paintings as interesting as possible. Use the snapshot feature to copy, paste, and print their paintings. Have a class discussion in which students explain why their paintings are one-half blue.

Another way to extend students' work with the Gizmo is class discussion. After students are done with their activity, discuss the following questions:

- What are some fractions that are equivalent to  $\frac{1}{2}$ ?
  - Which painting would have more red in it – one that is  $\frac{1}{4}$  red or one that's  $\frac{1}{5}$  red?
  - What happens to the value of a fraction when you increase its denominator?
5. **Follow-up activity: Fraction Gallery** (🕒 30 – 40 minutes)  
Let students use the Gizmo to create their own paintings. Have them use the snapshot feature to copy their paintings and then paste them into a word-processing application like Microsoft Word. Then have them write a short description of their work similar to the descriptions that appear in art museums. A description should include the title of the painting and a paragraph describing the mathematics behind it (including the total fractional value of every color used and how they determined it).

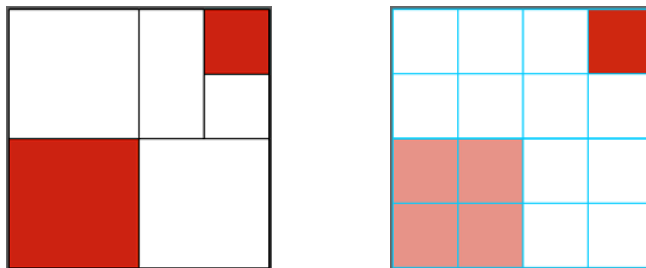
The paintings and descriptions can be printed out and displayed as a gallery of fraction art. Students can also invent questions about their paintings for other students to solve!



## Mathematical Background

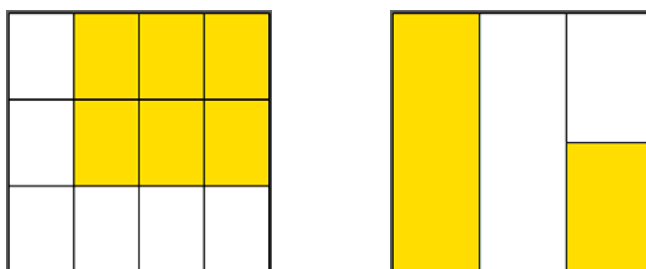
Students need to understand that the denominator of a fraction represents the number of *equal*-sized pieces that an object is divided into. Many students will look at the drawing on the left below and think that the small red section is one-sixth of the painting (because there are six sections). Of course, there *are* six sections, but they are not equal-sized, so none of them covers a sixth of the painting's area.

A primary goal of this Gizmo is to help students see why the small red section actually covers one-sixteenth ( $\frac{1}{16}$ ) of the painting (as shown to the right.)



In addition, if your students are ready for it, you can use the Gizmo to help them think about adding fractions with unequal denominators. To find what fraction of this painting is red, in total, students must find  $\frac{1}{4} + \frac{1}{16}$ . Even if they have not yet learned a formal procedure for finding a common denominator, the painting helps them see that in finding the sum, it is helpful to think of  $\frac{1}{4}$  as  $\frac{4}{16}$ . (The painting above is, in fact,  $\frac{5}{16}$  red.)

This Gizmo also provides opportunities for students to work with a more flexible model for fractions than traditional fraction bars or strips. This can lead to some interesting discoveries. For example, students may be surprised to discover that the paintings shown below are each one-half yellow!



## Selected Web Resources

Fraction Artist 1 Gizmo: <http://www.explorelearning.com/gizmo/id?1038>

Information about Piet Mondrian: <http://www.artchive.com/artchive/M/mondrian.html>

Modern Art at the Metropolitan Museum: [http://www.metmuseum.org/Works\\_of\\_art/modern\\_art](http://www.metmuseum.org/Works_of_art/modern_art)

More math/art activities: <http://www.morethanmath.org/>

Activity studying one-half: <http://pbskids.org/cyberchase/games/fractions/>