

Fraction Lab

About the Lesson

Students will use the PhET Build a Fraction simulation levels 1-4 and Fraction Lab to develop a basic understanding of fractions.

Objectives

Students will demonstrate their understanding of fractions by comparing numbers and pictures of

- equivalent fractions
- equal and unequal fractions by comparing using =, < and >
- addition of simple fractions using like denominators
- subtraction of simple fractions using like denominators

Level

Students in grades 3 – 5 can complete this activity.

Prior Learning

Students should have a basic understanding of fractions. They should understand that fractions are parts of a whole and the whole can be divided into different numbers of parts. PhET simulation, Fractions Intro, provides a foundational understanding of fractions excellent for completing this lesson.

Common Core State Standards

Number and Operations—Fractions 3.NF

Develop understanding of fractions as numbers.

1. *Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.*
3. *Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.*

- a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- b. *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.*
- c. *Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.*
- d. *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.*

Number and Operations—Fractions 4.NF

2. *Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $1/2$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions, e.g., by using a visual fraction model.*

Level(s) of Thinking (Blooms)

Remembering – students will be able to create pictures of fractions that match numerical expressions of fractions

Understanding – students will identify and describe information from article read through pictures

Applying – Students will compare and contrast fractions

Creating – Students will construct fractions, illustrate simple comparisons and operations of fractions

Mathematical Practice(s)

3 *Construct viable arguments and critique the reasoning of others.*

4 *Model with mathematics.*

6 *Attend to precision.*

Assessment

Formative assessment – students can use the Fraction Lab to create models of fractions matching those models to the numerical representation.

Summative assessment – students will correctly complete drawings representing their understanding of fractions.

Materials

For Students

- **Build a Fraction**
 - Select appropriate challenge for students depending on skill readiness.

For Teachers

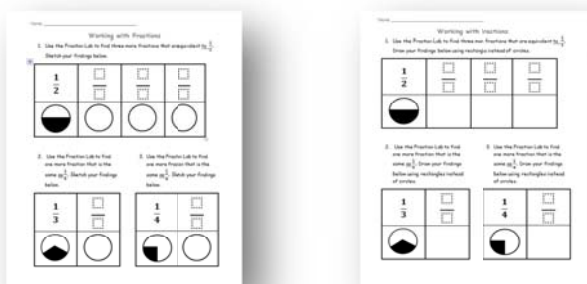
- Power Point – can be used as a quick start guide to using the PhET simulations. While students will be able to quickly discover on their own how to use the simulations, this power point will help the teacher highlight icons and their purpose. The power point would be especially useful if student time on computer is limited.

Activity Procedure

1. Activate prior knowledge. PhET simulation, Fractions Intro could be used as a whole class activity to review what students know.
2. Tell students they will learn more about fractions and how to represent them both as numbers and pictures.
3. If needed use the power point to provide students with a brief introduction to the activity and a quick how to use the icons lesson. This will provide students with background about the simulations before using the computers themselves.
4. This is an inquiry activity. It is designed to lead students to discovery of fractions, the relationship between fractions and visual comparison of fractions.
5. The student sheets included provide an open ended response opportunity for students.
6. The answers will vary by student. Assessment of completion will be unique to each student and should focus on student representation of their level of understanding.

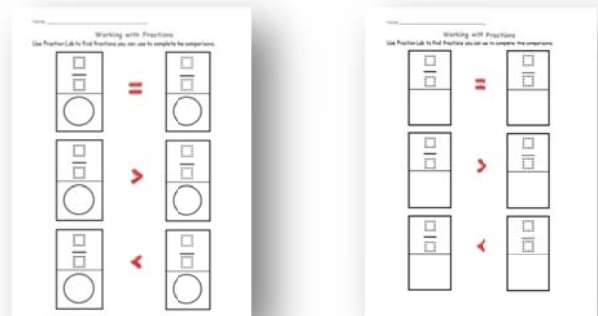
Working with Fractions Student Work

Equivalent Fractions



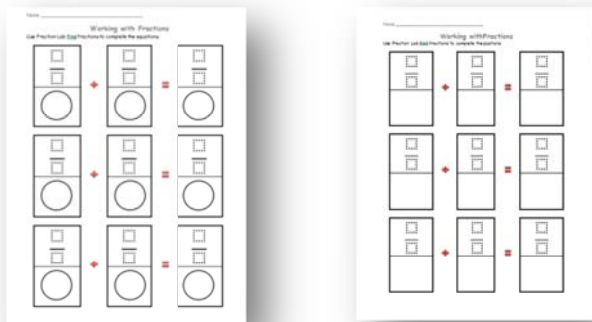
1. Challenge students to complete the equivalents fractions sheet.
2. After working with Build a Fraction Levels 1 through 4, invite students to proceed to the Fraction Lab section to build equivalent fractions and show their discoveries on this paper.
3. Select either the paper that invites students to represent equivalent fractions as circles or when students are fluent in identifying equivalent fractions using like representations challenge them to complete the sheet where they are asked to draw the representation in another form. Students may select to use the rectangles represented in the Fraction Lab simulation or select an alternative representation using a different shape or items.

Comparing Fractions



1. Challenge students to complete the fraction comparison sheets.
2. After working with Build a Fraction Levels 1 through 4, invite students to proceed to the Fraction Lab section to build fractions that complete the expressions and show their discoveries on this paper.
3. Select either the paper that invites students to represent fraction comparisons as circles or when students are fluent in comparing fractions using like representations challenge them to complete the sheet where they are asked to draw the representation in another form. Students may select to use the rectangles represented in the Fraction Lab simulation or select an alternative representation using a different shape or items.

Simple Addition Equations with Fractions



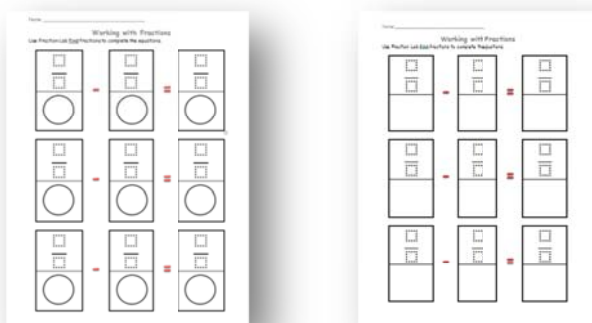
1. Challenge students to complete the fraction addition sheets.
2. After working with Build a Fraction Levels 1 through 4, invite students to proceed to the Fraction Lab section to build fractions that complete the equations and show their discoveries on this paper.
3. Select either the paper that invites students to represent fraction equations as circles or when students are fluent in adding fractions using like representations challenge them to complete the sheet where they are asked to draw the representation in another form. Students may select to use the rectangles represented in the Fraction Lab simulation or select an alternative representation using a different shape or items.
4. Students may use fractions with like denominators. Some students may attempt to add fractions with unlike denominators because the visual representation in Fraction Lab will allow them to see how fractions parts are added to create a new fraction.

2. After working with Build a Fraction Levels 1 through 4, invite students to proceed to the Fraction Lab section to build fractions that complete the equations and show their discoveries on this paper.
3. Select either the paper that invites students to represent fraction equations as circles or when students are fluent in subtracting fractions using like representations challenge them to complete the sheet where they are asked to draw the representation in another form. Students may select to use the rectangles represented in the Fraction Lab simulation or select an alternative representation using a different shape or items.
4. Students may use fractions with like denominators. Some students may attempt to subtract fractions with unlike denominators because the visual representation in Fraction Lab will allow them to see how fractions parts are subtracted to create a new fraction.

Accommodations/Suggestions for

- Gifted and Talented (GT)
Challenge gifted students to explore combining different size parts to create fraction drawings using color to show how $\frac{1}{2}$ is the same as $\frac{2}{4}$.
- English Language Learners (ELL)
Read instructions aloud and show sample completed sheet.
- Special Education (Sp. Ed.)
Since this is an inquiry activity, students will receive immediate feedback when working with Build a Fraction Levels 1 – 4. Monitor student progress through this section and share sample completed activities.

Simple Subtraction Equations with Fractions



1. Challenge students to complete the fraction subtraction sheets.

Resources / References

Interactive simulations found at <http://phet.colorado.edu/>