Fractions

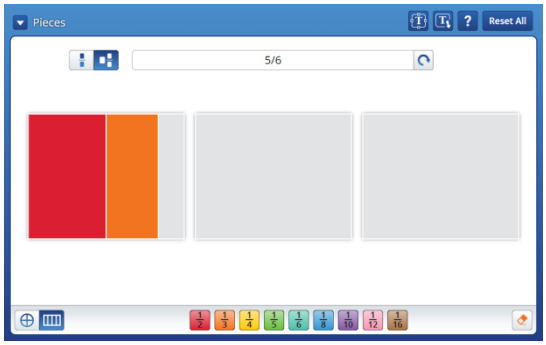
Fraction Sums and Mixed Numbers

You can add fractions to make mixed numbers.

- You can add fractions that have a denominator of 2, 3, 4, 5, 6, 8, 10, 12, or 16 (strips workspace used below).
- Make sure that the mode displays Pieces in the upper-left shell.
- When an improper fraction is displayed in the Odometer, click  to show it as a mixed number.

Practice Using the Pieces Mode in the Strips Workspace

1 Place fraction pieces in the workspace.



- Click $\frac{1}{2}$, then click $\frac{1}{3}$.
- Click  to show "5/6." Notice that the MathTool finds the least common denominator and displays the sum in the Odometer.
- Click $\frac{1}{6}$. Now you have made 6/6, or 1 whole.
- Click on  to switch back and forth between improper fraction and whole-number displays.

2 Continue to add fraction pieces to the workspace.

- Click $\frac{1}{12}$ three times. Click $\frac{1}{8}$ three times. Click $\frac{1}{5}$ twice.
- Notice the Odometer. As you go along, click  to see improper fraction and mixed-number representations of the pieces.

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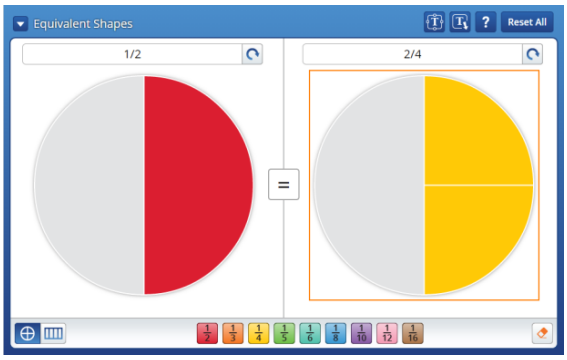
Modeling Equivalent Fractions

You can find equivalents of fractions less than 1. To get to the Equivalent Shapes mode, click  to see the drop-down menu and select **Equivalent Shapes**.

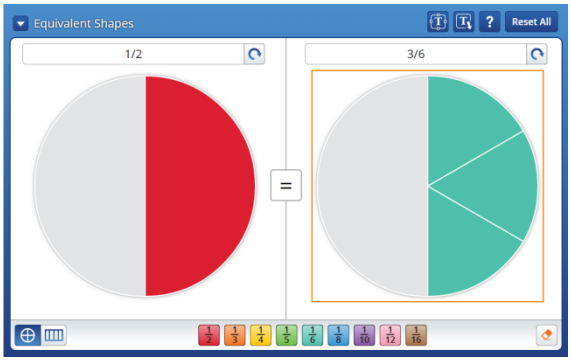
- The active workspace is marked by an orange highlight. Actions are applied to this workspace only.
- You can model fractions that have a denominator of 2, 3, 4, 5, 6, 8, 10, 12, or 16 (wedges workspace used below).

Practice Using Equivalent Shapes Mode

1. Model a fraction in the left workspace. Use 1/2.
   - Click  .
2. Find an equivalent fraction in the right workspace.
   - Click inside the right workspace. Notice the orange box around the active workspace.
   - Think of multiples of 2 to use for a denominator. Use 1/4.
   - Click  to place wedges in the circle until  appears between the two workspaces.



3. Find another fraction equivalent to 1/2.
   - Click  twice to erase the 2 wedges in the circle.
   - Click  to place wedges in the circle until  appears between the two workspaces.



4. Find more fractions equivalent to 1/2.
   - Repeat Step 3 using  ,  ,  , and  .

Additional Features

You can click  to see each part expressed as a fraction, a decimal, words, or a percent.

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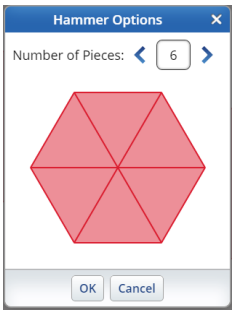
Constructing Fractions of Shapes

You can break shapes into fractional pieces. To get to the Modeling Fractions mode, click  to see the drop-down menu and select **Modeling Fractions**.

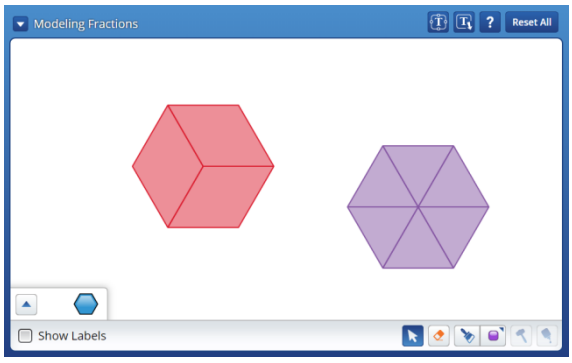
- The active shape is marked by  in the bottom left corner.
- You can break whole shapes apart to model fractions that have any denominator that evenly divides the shape, up to 12.

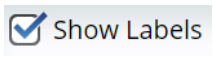
Practice Using Modeling Fractions Mode

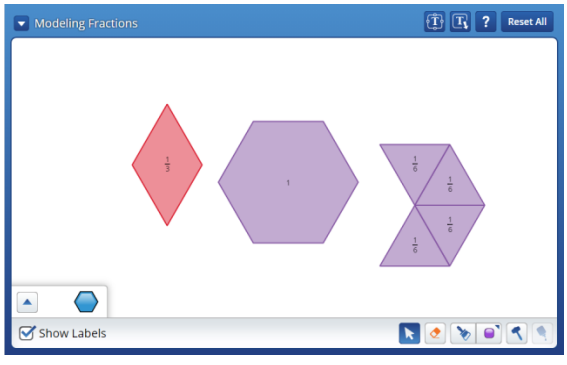
1. Select the shape to model.
   - Click the arrow in  and select the  from the menu.
   - Click and drag 2 copies of the hexagon into the workspace.
   - Click the right side of  and select  to change the selected color. Then click on a hexagon to paint it.



2. Break one shape into sixths.
   - Select the  and click on one of the hexagons.
   - In the Hammer Options dialog, click  to select 6 parts. Click OK to close the dialog.



3. Break the other shape into thirds.
   - Select the  and click on the other hexagon.
   - In the Hammer Options dialog, click  to select 3 parts. Click OK to close the dialog.
4. Drag the hexagon parts around to create new shapes. Compare the sizes of the parts.
5. Select  to show the sizes of all pieces.



6. Combine parts to make a whole again.
   - Select two 1/3 parts and two 1/6 parts with the  , to make 1 whole.
   - Click  to combine the parts into a hexagon.

Fractions

Modeling Fractions Less Than 1

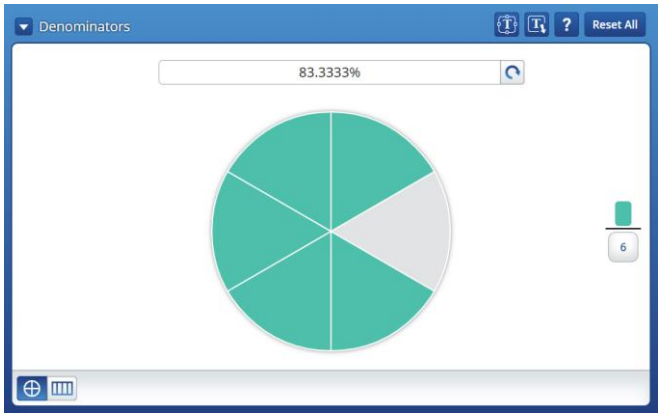
You can model a fraction using the Wedges workspace or the Strips workspace. To get to the Denominators mode, click  to see the drop-down menu and select **Denominators**.

- You can model fractions that have a denominator of 2, 3, 4, 5, 6, 8, 10, 12, or 16.
- Use  to shade a wedge or strip and also to clear the shading from a wedge or strip.
- Click on  to switch between the Wedges and Strips workspaces.

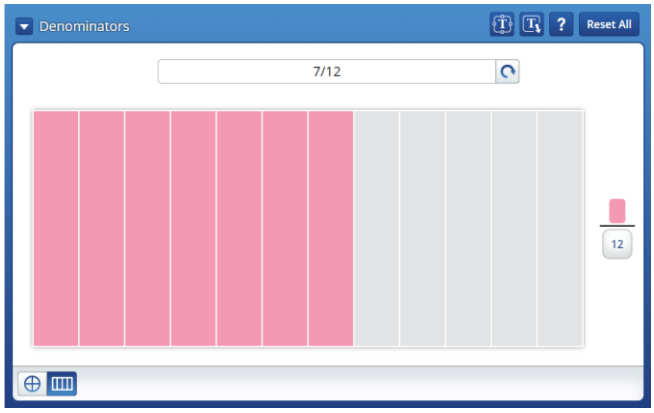
Practice Using Fraction Wedges

1. Choose a denominator for the fraction that you want to model.
   - Click in the denominator of the fraction.
   - Select from the denominator menu.

     Select  .
   - Notice the circle is now separated into six equal wedges.



2. Shade wedges to represent the numerator for the fraction that you want to model.
   - Choose a numerator. Use 5.
   - Click inside 5 of the 6 wedges to represent the numerator.
   - Notice the Odometer shows five sixths as "5/6."
3. Click  to see the decimal form of 5/6 inside the Odometer. Click again to see it in word form, again to see it as a percent, and one more time to hide the label entirely.



Practice Using Fraction Strips

4. The process is the same as those used in Steps 1 – 3 when you use the Strips workspace.
   - The fraction modeled at the right is 7/12.

Fractions

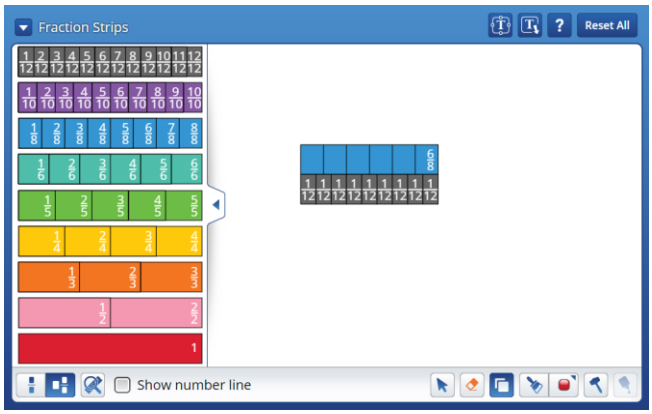
Building with Fraction Strips

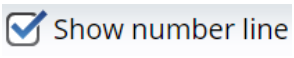
You can combine and compare fractions. To get to the Fraction Strips mode, click  to see the drop-down menu and select **Fraction Strips**.

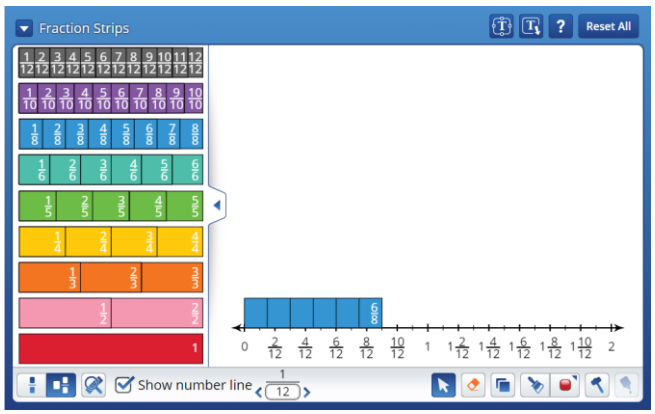
- You can model fractions that have a denominator of 1, 2, 3, 4, 5, 6, 8, 10, or 12.
- You can compare fraction strips to a number line.

Practice Using Fraction Strips Mode

1. Model the fraction 6/8.
   - In the palette, click on the sixth piece of the blue eighths bar  , and drag it into the workspace. A fraction bar of length 6/8 is created.
2. Use fraction strips to find an equivalent fraction with denominator 12.
   - In the palette, click on the first piece on the black twelths bar  , and drag it into the workspace. Line it up below one end of the blue bar.
   - Use the  to make copies of the 1/12 bar, lining each one up below the blue bar, until the lengths are equal.



3. Or use the number line to find an equivalent fraction with denominator 12.
   - Select  to view a number line in the workspace.
   - Drag the blue fraction bar to the left end of the number line, lining it up with 0.
   - Click the  buttons to change the denominator modeled by the number line. Select  .
   - Read the label on the tick mark at the right end of the 6/8 fraction bar to find the equivalent fraction.



Additional Features

You can use  to find the sum of fraction strips. Click on strips to add their lengths to the sum.

Fractions

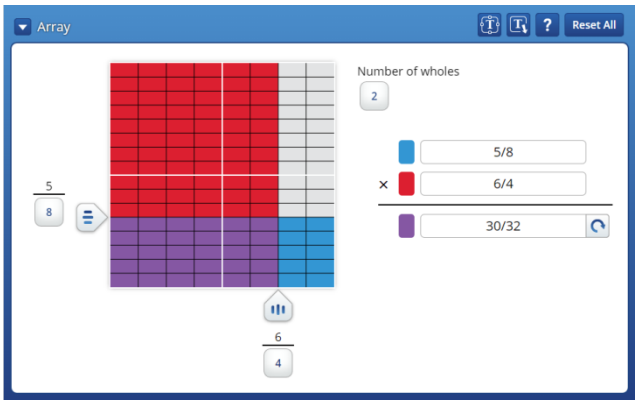
Multiplying Fractions

To get to the Array mode, click  to see the drop-down menu and select **Array**.

- You can multiply two fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, or 16.
- When you change the denominators in the fractions, you adjust the number of squares in 1 whole. You can also change the number of whole numbers that the array models.
- The purple shaded rectangle's width and length correspond to the numerators of the fractions.

Practice Using Arrays

1 Set the size of the array. Use 2.

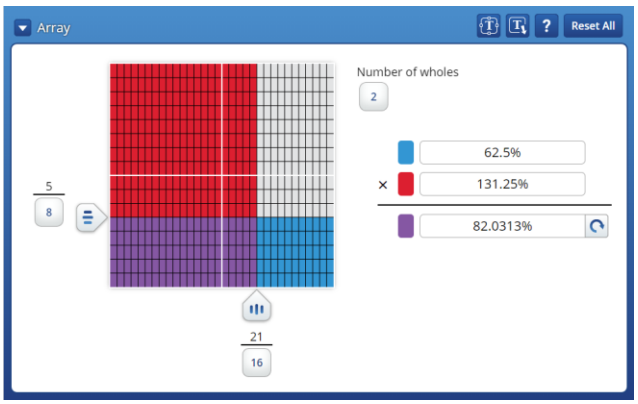


- Click the Number of wholes button.
- Select 2 from the menu 1 2 3 4 5.

2 Name your first factor. Use 5/8.

- Click on the denominator of the fraction along the vertical scale.
- Select 8 from the menu to name the denominator.
- Click on and drag to adjust the numerator to 5.
- Click and notice the first factor, 5/8, is shown as "5/8" in the top Odometer.

3 Name your second factor. Use 21/16.



- Click 4 in the denominator of the fraction along the horizontal scale.
- Select 16 from the menu to name the denominator.
- Click on and drag to adjust the numerator to 21.
- Notice the second factor, 21/16, is shown as "21/16" in the middle Odometer.

4 The product, 105/128, is shown as "105/128" in the bottom Odometer. Click to see the Odometer amounts as decimals, written as words, or as percents.

Fractions

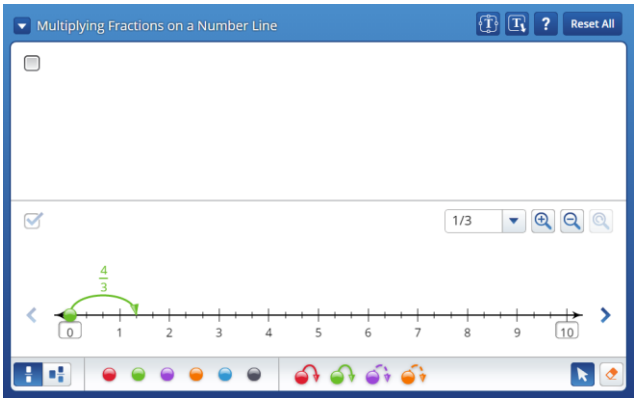
Modeling on a Number Line

You can model fraction multiplication on a number line. To get to the Multiplying Fractions on a Number Line mode, click  to see the drop-down menu and select **Multiplying Fractions on a Number Line**.

- You can model fractions with a denominator of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, or 100.

Practice Multiplying Fractions on a Number Line

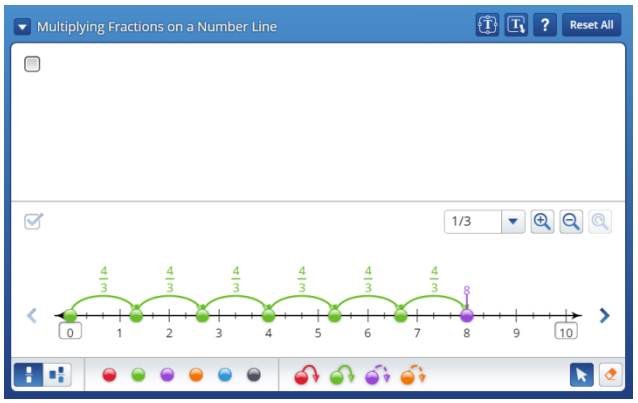
1. Model the fraction 4/3 on the number line.



   - Click  and select 1/3 from the menu.
   - Drag  from the bottom shell onto the number line, with its left point at the 0 tick mark.
   - Drag the arrow portion of the arc to the right, to 4/3. The arc label is now "4/3".

2. Multiply 4/3 × 6 on the number line.

   - Drag another  from the bottom shell onto the number line, with its point at the arrow of the first arc. The new arc resizes to match the first one.
   - Continue until you have 6 copies of the arc.



   The final arc lands on the product 4/3 × 6.

   - Drag  from the bottom shell to the end of the final arc to show the product.

Additional Features

- You can change the endpoints of the number line by dragging the line, by clicking the  arrows, or by clicking on an endpoint label  and entering an endpoint value using the keyboard or the keypad.
- You can change the range of the number line by clicking the  buttons.