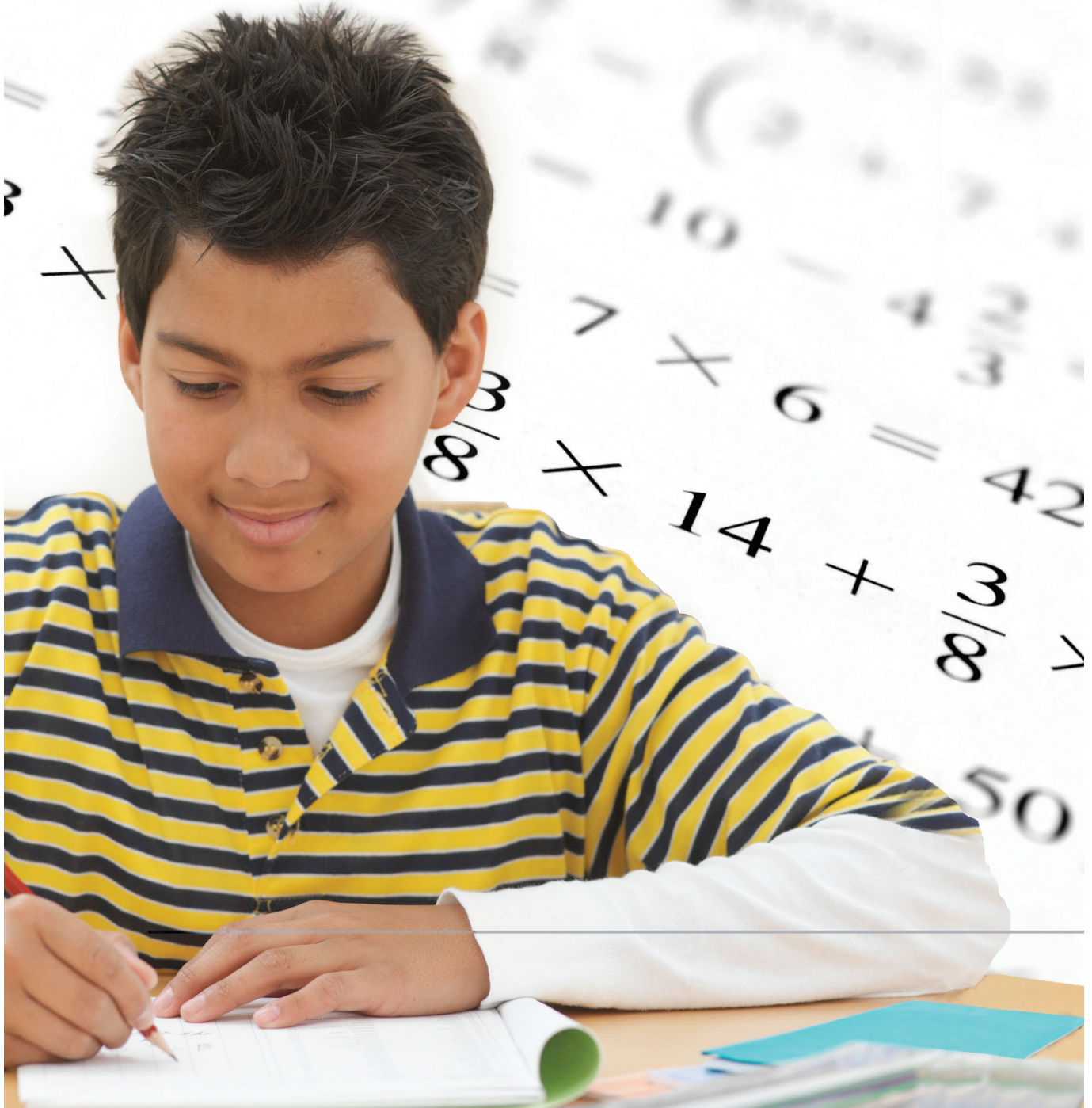


# Learning About Fractions at Home: Evidence-Based Tips for Parents and Caregivers

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U.S. DEPARTMENT OF EDUCATION

*A Publication of the National Center for Education Evaluation at IES*





## In this set of tips, you'll learn about how to:

### 1. Support Children's Understanding of Fractions at Home with Activities on Dividing Objects

Parents and caregivers can help children build on the strategies they already have for dividing objects to develop an understanding of basic fraction concepts.

Recommended for grades: **K** 1 2 3 4 5 6 7 8

### 2. Support Children's Understanding of Fractions at Home with Measurement Activities

Measurement activities—such as measuring lengths, volume, and other quantities—can help children understand that fractions, like whole numbers, can be used to measure quantities, but allow for more exact measurement.

Recommended for grades: **K** 1 2 3 4 5 6 7 8

### 3. Support Children's Understanding of Fractions Using Household Measurement Tools

Opportunities to use household measurement tools can help children understand the relative size of fractions with different denominators and identify fractions on a number line.

Recommended for grades: **K** 1 2 3 4 5 6 7 8

### 4. Support Children's Understanding of Fractions by Thinking About How to Use Them in the Real World

By encouraging children to apply their fractions knowledge to real-world contexts, parents and caregivers can provide meaning to fractions and help children solve problems presented in formal notation.

Recommended for grades: **K** 1 2 3 4 5 6 7 8

# 1. Support Children's Understanding of Fractions at Home with Activities on Dividing Objects

*These activities are typically appropriate for children in kindergarten through fifth grade.*

Parents and caregivers can help children build on the strategies they already have for dividing objects, such as equally sharing a set of objects, to develop an understanding of basic fraction concepts. These tips are based on the [\*Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Practice Guide\*](#).

## Start with an activity that involves equally sharing a set of objects among a group.

- Children can draw a picture or use physical objects such as pebbles, candies or blocks to demonstrate sharing among a group.

## Follow with an activity that involves equally sharing a single, whole object.

- Children can draw a picture of a single object and mark divisions on their drawing or use an object that can be easily divided into pieces.

**These tips are appropriate for children in grades K to 5, but children in grades 3 to 5 should be encouraged to write out the fractions in each activity below (for example,  $\frac{1}{2}$ ,  $\frac{2}{3}$ , or  $\frac{3}{4}$ ).**

### Example activity for equally sharing a set of objects: sharing candies

**Materials needed:** 12 candies, or other countable objects

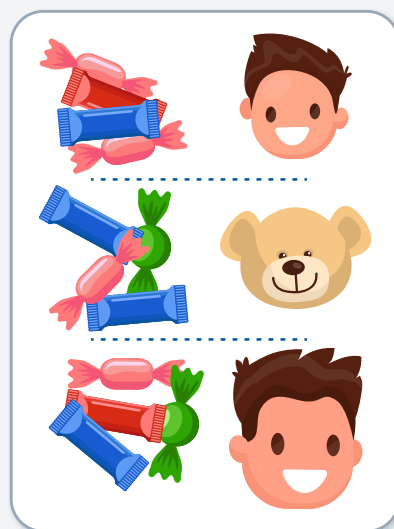
**Adult:** I have 12 pieces of candy. I want to share them with you and your friend so that all three of us have the same number of candies. Can you help me share the candy among the three of us?

**Child** moves each piece of candy, alternating between three piles of candy until all candies have been distributed.

**Adult:** Now that we have three groups of candies, let's count how many are in each group to make sure they have the same number.

**Child** counts four candies in each group. Some children may count candies individually by ones, while others may count by twos or fours.

**Adult:** Great! When we share the 12 candies between three groups, we each get four pieces of candy, or one-third of the candies.





Now try sharing the candies among groups of two or four to illustrate halves and fourths of a set of objects.

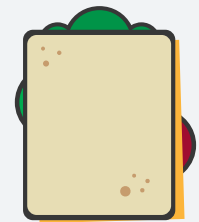


Ask, “How does the number of objects each person receives change when we increase the number of people?”

### Example activity for equally sharing a single object: sharing a sandwich

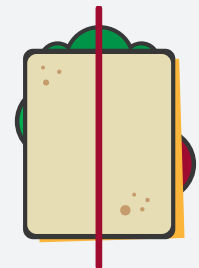
**Materials needed:** paper and crayon, or an actual sandwich

**Adult:** Let’s pretend we have one sandwich. Can you draw one big sandwich for me?



**Child** draws a sandwich

**Adult:** Thank you! We only have one sandwich, but I want to share this sandwich with you. Can you draw a line on this sandwich to show me where I would cut it so that we both have the same amount of sandwich?



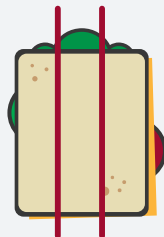
**Child** draws a line through the middle of the sandwich (the child may draw the line vertically, horizontally, or diagonally between two corners).

**Adult:** Great! When you cut the sandwich down the middle, you get two equal pieces, or halves. One half for me and one half for you.

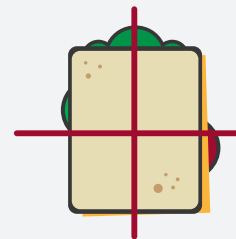


Also try equally sharing the sandwich among three or four people to illustrate thirds and fourths of an object.

**One way to share a sandwich between three people:**



**One way to share a sandwich between four people:**



Ask, “How does the size of the pieces change when we increase the number of people?”



For older children using formal fraction notation, ask, “How would you order the fractions from greatest to least amount of sandwich?”

These tips for parents and caregivers are based on the first action step, “Use equal-sharing activities to introduce the concept of fractions,” within Recommendation 1, “Build on students’ informal understanding of sharing and proportionality to develop initial fraction concepts,” from the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade](https://ies.ed.gov/ncee/wwc/PracticeGuide/15) Practice Guide (<https://ies.ed.gov/ncee/wwc/PracticeGuide/15>).



## 2. Support Children’s Understanding of Fractions at Home with Measurement Activities

*These activities are typically appropriate for children in kindergarten through fourth grade.*

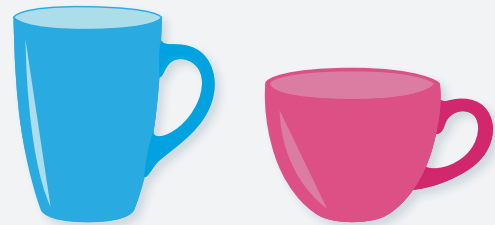
Measurement activities—such as measuring lengths, volume, and other quantities—can help children understand that fractions, like whole numbers, can be used to measure quantities, but allow for more exact measurement. These tips are based on the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Practice Guide](#).

- **Measure quantities** of water using two different-sized cups to demonstrate how to use fractions to measure quantities.
- **Identify objects**, ideally with a straight edge, in your home to use as a “measurement tool.” You can use these objects to “measure” your child.

### Example activity measuring with household objects: measuring cups of water

**Materials needed:** two cups that hold different quantities of water

**Adult:** I have two different-sized cups. Let’s see how many cups of water from the smaller, pink cup will fill up the larger, blue cup.



**Child** fills the larger cup with water from the smaller cup, counting each pour.

**Adult:** It looks like one pour from the pink cup wasn’t enough to fill up the blue cup, but two pours would have been too much. We needed between one and two cups of water from the pink cup to fill the blue cup exactly. About a quarter of the pink cup is still full of water. That means the blue cup can hold an amount of water that is just about equal to one and three quarters of the pink cup.

The dialogue for this activity can be modified based on the size of the cups available at home.

- ! Also try estimating how much of the larger cup would fill the smaller cup.
- ? Ask, “About how many pink cups do we need to fill two blue cups?”

## Example activity measuring with household objects: measuring your child with sheets of paper

**Materials needed:** Sheets of paper (such as newspaper or construction paper), pieces of string, or sticks. Select objects that are equal in size.

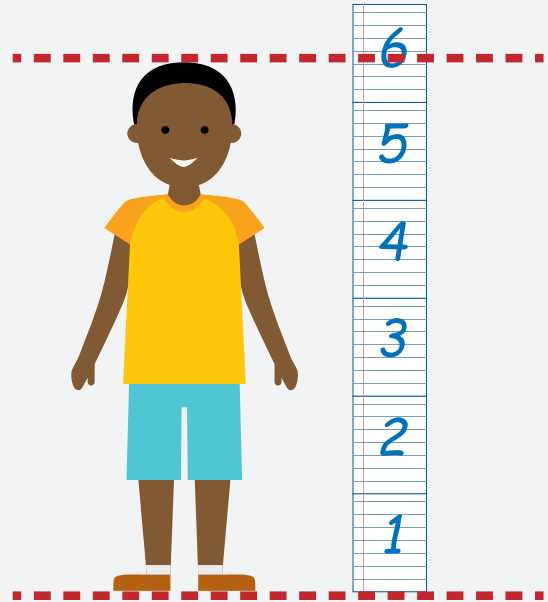
**Adult:** I have some notebook paper here. I wonder how many pieces of paper I would need to measure how tall you are. Let's find out!

**Child** lies down, face up. Line pieces of paper along the length of the child, starting from the child's feet and ending at the top of the child's head. Mark the paper where the top of the child's head is.

**Adult:** How many pieces of paper did we need to measure you?

**Child:** Six full sheets of paper are a little too long, but five sheets of paper are not long enough to measure my height.

**Adult:** Yes, you are between five and six pieces of paper long. The top of your head reached about halfway (or a quarter of the way, three quarters of the way, and so on) of the sixth sheet of paper. That means you are about five and one half pieces of paper long.



The dialogue for this activity can be modified based on the height of your child and size of paper available at home.

**!** Now have your child try measuring an object that is shorter than they are (for example, a book or a shoe) and longer than they are (for example, another adult, a bench, or a car) with the same measurement tool.

**?** Ask, "How would the measurement change if we used half sheets of paper instead of the whole paper?"

These tips for parents and caregivers are based on the first action step, "Use measurement activities and number lines to help students understand that fractions are numbers, with all the properties that numbers share," within Recommendation 2, "Help students recognize that fractions are numbers and that they expand the number system beyond whole numbers," from the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade](https://ies.ed.gov/ncee/wwc/PracticeGuide/15) Practice Guide (<https://ies.ed.gov/ncee/wwc/PracticeGuide/15>).

### 3. Support Children’s Understanding of Fractions Using Household Measurement Tools

*These activities are typically appropriate for children in third through fifth grade.*

By providing opportunities to use household measurement tools, parents and caregivers can help children understand the relative size of fractions with different denominators and identify fractions on a number line. These tips are based on the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Practice Guide](#).

- **Use measuring cups** to compare the amount of liquid that different-sized cups can hold and demonstrate ways to measure one cup.
- **Use a ruler** to compare the lengths of different fractions in one foot.

#### Example activity with household measuring tool: comparing fractions with measuring cups

**Materials needed:** a variety of measuring cups ( $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{1}{2}$ , 1 cup, and/or a liquid measuring cup with markings), water

**Adult:** I have a few types of measuring cups here. We use these cups to measure specific amounts of liquid for cooking, baking, and other activities where we need to make sure we have the right amount of an ingredient. Let’s explore the different ways we can measure one cup of water. How many quarter cups will it take to fill one cup? Count out loud as you try it.

**Child** uses a  $\frac{1}{4}$  measuring cup to fill up a 1-cup measuring cup.


**Adult:** How many quarter cups did you need to fill one cup?


**Child:** I needed four pours of the  $\frac{1}{4}$  measuring cup to fill up one cup.

**Adult:** Yes! Now let’s try with the  $\frac{1}{3}$  measuring cup. Count out loud again.

**Child:** I needed three pours of the  $\frac{1}{3}$  measuring cup to fill up one cup.



 Ask, “How did the number of pours change as we increased the size of the cup you used to pour the water? What do you think would happen if we decreased the size of the cup instead?”

 Have your child fill up multiple measuring cups and put them in order from least to greatest amount.

## Example activity with household measuring tool: comparing fractions with a ruler

**Materials needed:** 12-inch ruler, paper, scissors, a marker

**Adult:** This ruler is 12 inches long, which is equal to one foot. Each inch is one twelfth of a foot. Can you place this ruler on a piece of paper and write labels on the paper above each inch to show the fraction of one foot it represents?

**Child** places ruler on a piece of paper and labels each inch of the ruler on the paper so 1 inch equals  $\frac{1}{12}$ , 2 inches equals  $\frac{2}{12}$ , 3 inches equals  $\frac{3}{12}$ , and so on.

Older children should be encouraged to write equivalent fractions. If appropriate based on your child's level of fractions knowledge, ask the following question.

**Adult:** Can you write an equivalent fraction for each of the labels you made?

The italic black fractions in the image below are the original fractions for each inch, and the bold green fractions are examples of equivalent fractions. See page 10 for a reference guide on **numerators** and **denominators** of fractions and **equivalent fractions**.



**Adult:** Now, we can use strips of paper to see how long some fractions are compared to others. Let's see how long a strip of paper that is one third, or  $\frac{4}{12}$ , of a foot long is and how long a strip that is one quarter, or  $\frac{3}{12}$ , of a foot long is.

**Child** cuts a strip of paper that is one third of a foot long (4 inches) and one that is one quarter of a foot long (3 inches). The child can label the strip with the fraction it represents.

**Adult:** Which strip is longer? How many of the one-third foot strips would we need to make one foot? How many of the one-quarter strips would we need to make one foot?

**!** Have your child cut strips of paper that represent other fraction lengths, including  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ , and so on. Ask them to order the strips from longest to shortest length.

**?** Ask, "If I have a paper that is two thirds of a foot long, how many more inches would make 1 foot?"

These tips for parents and caregivers are based on the second action step, "Provide opportunities for students to locate and compare fractions on number lines," within Recommendation 2, "Help students recognize that fractions are numbers and that they expand the number system beyond whole numbers," from the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade](https://ies.ed.gov/ncee/wwc/PracticeGuide/15) Practice Guide (<https://ies.ed.gov/ncee/wwc/PracticeGuide/15>).



## 4. Support Children's Understanding of Fractions by Thinking About How to Use Them in the Real World

*These activities are typically appropriate for children in fourth through eighth grade.*

By encouraging children to apply their fractions knowledge to real-world contexts, parents and caregivers can provide meaning to fractions and help children solve problems presented in formal notation. These tips are based on the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Practice Guide](#).

- **Encourage your child** to think about problems involving fractions in everyday contexts. Cooking and baking activities provide a fun, real-world application of fractions knowledge.

### Example activity: halving a cookie recipe

**Materials needed:** cookie recipe, recipe ingredients, measuring cups, bakeware

**Adult:** I have a recipe for cookies that I would like to make with you! The recipe makes 24 cookies, but we want to make half of that. How many cookies is half of 24, and how much of each ingredient do we need to make half of the recipe?

**Child** Half of 24 is 12. *Child then reads the recipe and creates a table that lists each ingredient in one column, the original quantities in the next column, and the quantities that they calculate by multiplying each quantity by  $\frac{1}{2}$  in the last column. For example:*

Name of ingredient	Original quantity	$\frac{1}{2}$ of original quantity
Sugar	1 cup	$\frac{1}{2}$ cup
Flour	3 cups	$1\frac{1}{2}$ cups
Eggs	2 eggs	1 egg



**?** Ask, “How would the quantities change if we decided to double the recipe instead? What if we wanted to make three quarters of the recipe?” Note: Child should multiply quantities by 2 in order to double a recipe and multiply quantities by  $\frac{3}{4}$  to make three quarters of a recipe.

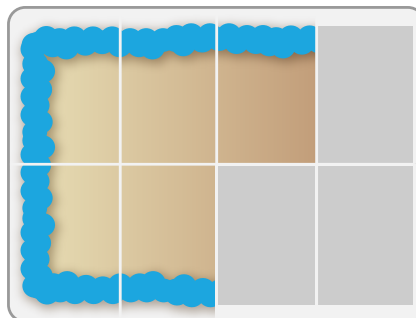
**!** Other contexts in which you can encourage your child to apply fractions concepts include family gatherings, school events, or other extracurricular activities that your child is involved in.

This tip for parents and caregivers is based on, “Present real-world contexts with plausible numbers for problems that involve computing with fractions,” within Recommendation 3, “Help students understand why procedures for computations with fractions make sense,” from the [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade Practice Guide](https://ies.ed.gov/ncee/wwc/PracticeGuide/15) (<https://ies.ed.gov/ncee/wwc/PracticeGuide/15>).

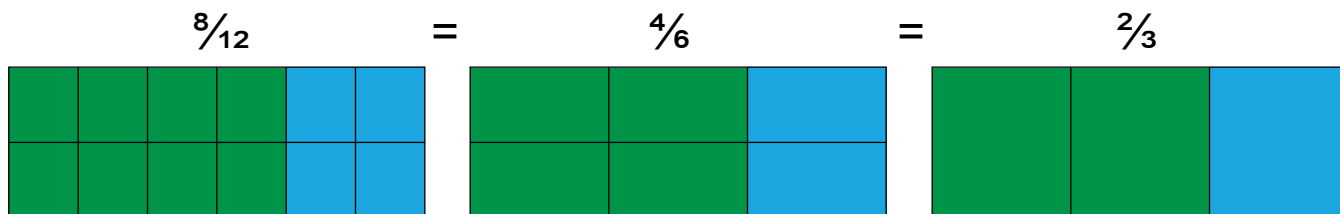
## Reference on Fraction Concepts for Parents and Caregivers

**Denominator versus numerator:** A fraction is made up of two parts: the *denominator* and the *numerator*. The denominator, or the bottom number of a fraction, is equal to the total number of parts that create a whole object. The numerator, or the top number of a fraction, is equal to the number of parts of the whole that are being considered.

For example, if there are eight pieces of a cake and three pieces are eaten, then 8 represents the denominator and 3 represents the numerator. So,  $\frac{3}{8}$  of the cake has been eaten.



**Equivalent fractions** are fractions with values that are exactly the same (they represent the same amount) but are written with different numerators and denominators. For example,  $\frac{8}{12}$  is equivalent to  $\frac{4}{6}$  or  $\frac{2}{3}$ . Even though these fractions look different, they have the same value.



You can calculate an equivalent fraction by multiplying both the numerator and denominator of a fraction by the same number. Alternatively, choose a number that both the numerator and denominator can be divided by and result in a whole number. This number is called a **common factor** for the numerator and denominator.

$$\frac{2}{3} \xrightarrow{\times 2} \frac{4}{6} \xrightarrow{\times 2} \frac{8}{12}$$

$$\frac{8}{12} \xrightarrow{\div 2} \frac{4}{6} \xrightarrow{\div 2} \frac{2}{3}$$

## About the What Works Clearinghouse Fractions Tips

The What Works Clearinghouse, funded by the U.S. Department of Education, reviews existing research on programs, products, practices, and policies in education. Our goal is to provide educators with the information they need to make evidence-based decisions. Bringing together rigorous research practice and content expertise, the WWC creates Practice Guides to equip educators with the best available evidence and expertise on current challenges in education.

## About the Tips for Learning About Fractions at Home

This set of tips can help parents and caregivers carry out recommendations in the Institute of Education Sciences Educator's Practice Guide, *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade*, at home. Evidence in the practice guide is drawn from research that meets What Works Clearinghouse (WWC) standards and is authored by Robert Siegler, Thomas Carpenter, Frances (Skip) Fennell, David Geary, James Lewis, Yukari Okamoto, Laurie Thompson, and Jonathan Wray. To learn more about the research evidence and for additional recommendations and action steps for learning about fractions at home, read the full practice guide: [https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/fractions\\_pg\\_093010.pdf](https://ies.ed.gov/ncee/wwc/Docs/PracticeGuide/fractions_pg_093010.pdf).

