



Why Do You Flip the Fraction When Dividing?

Video: 3:27 · Episode 002**Grades:** 5–7 · Math**Time:** 30–45 min (video + worksheet + quiz)**Key term:** reciprocal (rih-SIP-ruh-kul)**Connects to Common Core:** 5.NF.B.7 (divide whole numbers by unit fractions) · 6.NS.A.1 (divide fractions by fractions, with visual models)

The big idea

"Flip and multiply" isn't a trick. Dividing can ask "**how many pieces of this size fit?**" To find how many $\frac{2}{3}$ s fit into 4, first cut every whole into thirds (that's $\times 3$: 12 thirds), then group the thirds in twos (that's $\div 2$: 6 groups). Times 3, then divided by 2, is the same as times $\frac{3}{2}$, the fraction flipped. The bottom number cuts; the top number groups.

One-line recap students should be able to say: "We flip because the bottom number cuts, and the top number groups."

Learning goals

- Read $12 \div 3$ as "how many 3s fit into 12?" and explain why dividing by a fraction less than 1 gives a bigger answer.
- Model $a \div b/c$ with bars: cut into c pieces, then group by b .
- Connect " $\times$ bottom, $\div$ top" to multiplying by the reciprocal.
- Solve a real "how many fit" problem two ways: with bars and with the flip.

How to use it

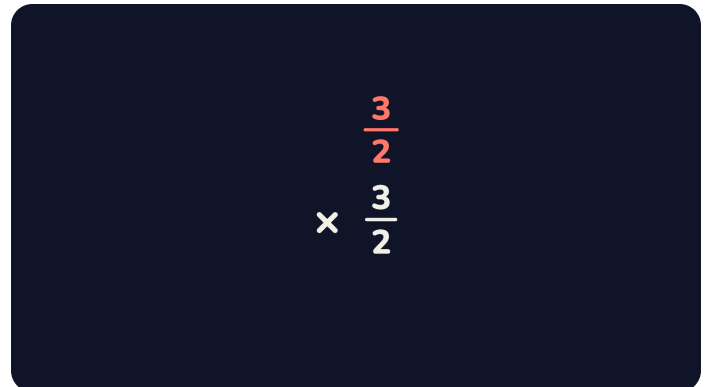
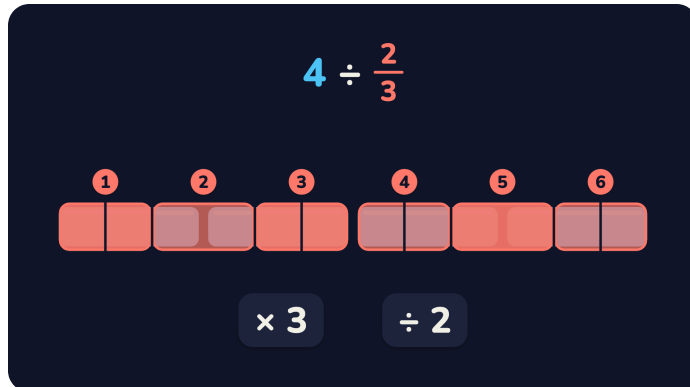
1. **Before watching (3 min):** students answer the prediction on the worksheet. Don't correct them yet.
2. **Watch (4 min):** play the video once straight through. Pause at about 2:04, right after "That's two thirds, flipped!", if you want a check-in.
3. **Worksheet (10 min):** fill in the blanks, then draw bars for $2 \div \frac{2}{3}$.
4. **Discuss (10 min):** pick two or three discussion questions.
5. **Quiz (5 min):** six quick questions; answer key on the last page.

What the video simplifies (so you can answer the sharp questions): it uses the "how many fit" meaning of division (measurement division); the sharing meaning (12 cookies among 3 friends) gives the same answers. "Dividing makes things smaller" only holds when you divide a positive number by a number greater than 1. Every example divides evenly; with $3 \div \frac{2}{3} = 4\frac{1}{2}$ the same cut-then-group idea leaves half a group over.



Fold, Count, Group

Students build the video's bars with paper strips and find $4 \div \frac{2}{3}$ without any rule, then check it with the flip.



From the video: cut into thirds ($\times 3$), group in twos ($\div 2$)

$\times 3$ and $\div 2$ lock together into $\times \frac{3}{2}$

You need (per pair)

- 4 strips of paper, all the same length (each strip is one whole)
- A pencil, scissors (optional), and a few paper clips

Steps

1. Lay out the 4 strips. Write "1" on each: these are your 4 wholes.
2. Fold each strip into 3 equal parts and draw lines on the folds. Count the thirds. (12)
3. Clip the thirds together in twos (or color each pair). Count the groups. (6)
4. Write it as math: $4 \times 3 = 12$, then $12 \div 2 = 6$. Now check: $4 \times \frac{3}{2} = 6$.
5. Challenge: use 3 new strips to find $3 \div \frac{3}{4}$. (Fold in fourths: 12 quarters; groups of three: 4.)

Tip: folding a strip into thirds is easiest as a "letter fold." For fourths, fold in half twice. Pre-marked strips save time for younger students.

Talk about it

- Which step used the bottom number of $\frac{2}{3}$? Which step used the top number?
- Why did the answer (6) come out bigger than the number you started with (4)?
- Try $3 \div \frac{2}{3}$. What happens with the last third? What does that leftover mean?



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Name: _____

Date: _____

Before you watch

Your teacher says $3 \div \frac{1}{2} = 6$. Dividing made the number bigger. Why do you think that happens?

While you watch: fill in the blanks

1. $12 \div 3$ can ask: how many _____ fit into 12?
2. $3 \div \frac{1}{2} =$ _____, because each whole holds two halves.
3. To divide by $\frac{2}{3}$, first cut every whole into _____, then group them in _____.
4. The bottom number says how to _____, so you multiply by it.
5. The top number says how many pieces make a _____, so you divide by it.
6. The flipped fraction is called the _____.

Draw it

Draw bars to find $2 \div \frac{2}{3}$. Show the cuts and the groups, then write the answer.

$$2 \div \frac{2}{3} = \underline{\quad}$$

Explain it

Explain to a friend why $4 \div \frac{2}{3}$ is the same as $4 \times \frac{3}{2}$.



Talk It Over, Then Check Yourself

Discussion questions

1. When does dividing make a number smaller, and when does it make it bigger? Find an example of each.
2. A classmate says " $4 \div \frac{2}{3} = 4 \times \frac{2}{3}$." How would you use bars to show them the mistake?
3. How many 15-minute ($\frac{1}{4}$ -hour) shows fit into 2 hours? Solve it with bars and with the flip.
4. What is $3 \div \frac{2}{3}$? What does the " $\frac{1}{2}$ " in the answer mean in the bar picture?
5. If you forgot the rule on a test, how could you figure it out again?

Quiz

Name: _____

1. $12 \div 3$ asks "how many 3s fit into 12?" What is the answer? (Circle one.)
A. 36
B. 4
C. 9
D. 15
2. What is $3 \div \frac{1}{3}$?
A. 1
B. 3
C. 6
D. 9
3. What is the reciprocal of $\frac{3}{5}$?
A. $\frac{5}{3}$
B. $\frac{3}{5}$
C. 15
D. $\frac{2}{5}$
4. What is $4 \div \frac{2}{3}$?
A. $\frac{8}{3}$
B. 2
C. 6
D. 12
5. True or false: dividing a positive number by a fraction less than 1 gives an answer bigger than the number you started with. _____
6. A recipe needs 3 cups of flour. Your scoop holds $\frac{3}{4}$ cup. How many scoops? Show how you know.



Answer Key

Worksheet: fill in the blanks

1. threes · 2. 6 · 3. thirds, twos · 4. cut · 5. group · 6. reciprocal

Draw it: 2 bars, each cut into 3 thirds (6 thirds), grouped in twos: **3 groups**, so $2 \div 2/3 = 3$. Check: $2 \times 3/2 = 3$.

Explain it: to fit $2/3$ s into 4, cut each whole into thirds ($\times 3 = 12$ thirds), then group the thirds in twos ($\div 2 = 6$). Times 3 then divided by 2 is the same as times $3/2$.

Quiz

1. **B.** 4. Four threes fit into twelve.
2. **D.** 9. Each whole holds three thirds; three wholes hold nine.
3. **A.** $5/3$. Flip the fraction over.
4. **C.** 6. Twelve thirds, grouped in twos. (A, $8/3$, is what you get if you multiply without flipping.)
5. **True.** The piece is smaller than one whole, so more than one fits in each whole.
6. **4 scoops.** Cut each cup into quarters (12 quarters), group them in threes (4 groups); or $3 \times 4/3 = 4$.

Discussion: points to listen for

1. Smaller when dividing by a number greater than 1 ($12 \div 3$); bigger when dividing by a number between 0 and 1 ($3 \div 1/2$).
2. Bars show 6 groups of $2/3$ fit into 4; $4 \times 2/3$ is only $8/3$ (less than 3), so it can't be how many fit.
3. 8 shows: each hour holds 4 quarters, so 2 hours hold 8; or $2 \times 4/1 = 8$.
4. $4\frac{1}{2}$: 9 thirds make 4 full groups of two, with one third left over, which is half of a group.
5. Draw the bars: cut by the bottom number, group by the top number.

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