How Many Fit? Dividing Fractions

Teacher		**Class**	Grade 6
Subject	Math	**Topic**	Dividing fractions
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn to interpret and compute fraction-by-fraction division. They draw models, use keep-change-flip, and solve story problems.

Curriculum links

- Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. [1]
- recognize that dividing by a rational number and multiplying by its reciprocal result in equivalent values [2]

Learning objectives

- Students will interpret fraction division as a fit question using models.
- Students will compute quotients of fractions by fractions using the reciprocal.
- Students will create a story context for dividing fractions and solve it.

Success criteria

- I can draw a model for (2/3) ÷ (3/4) and show 8/9.
- I can use keep-change-flip and check with multiplication.
- I can write a story problem and match model to equation.

What students already know

Show 4 ÷ 1/4 on a number line. Ask: how many quarter jumps fit in 4? Listen for 16 [3].

Key words

dividend	the starting amount that is split up [3]
divisor	the amount we fit in or split by [3]
quotient	the answer you get after a division [3]
reciprocal	the flipped fraction that makes 1 when multiplied [4][9]

Materials

- drawing paper
- colored pencils
- projector and Slides 1-5, 7-11
- small whiteboards and markers
- printed copies of Worksheet Task B for class practice
- printed copies of Worksheet Task A for homework
- printed sentence-frame strips and same-size bar outlines

Before the lesson

- Print drawing paper, bar outlines, sentence-frame strips, and Worksheet Tasks A and B
- Test Slide 5 Video clip 1 (0:00-4:09) and Slide 7 Video clip 2 (0:00-5:00) with sound
- Set up projector, whiteboards, and wall space to post stories and models

Lesson outline

0–7 min **Starter** 7 min · Whole class

Connects whole-number division to fraction division and launches the paint story.

YOU DO

1. Show Slide 1 Dividing Fractions and Slide 2 objectives in your own words.
2. Pose the hook: Two-thirds of a jug of paint is left. Each tray needs three-fourths of a jug. What can an art helper learn from that?
3. Ask if a full 3/4 piece fits in 2/3 and recall 6 ÷ 2 asks how many 2s fit in 6.
4. Take quick answers and preview that the quotient can be smaller than 1.

STUDENTS DO

1. Listen to objectives and the paint hook.
2. Turn and talk with a partner about whether 3/4 fits in 2/3.
3. Share ideas about what division asks.

Say: Today we ask how many fit inside. Two-thirds of a jug of paint is left. Each tray needs three-fourths of a jug. Does even one full tray fit, and how do we write that as division?

Ask: 6 ÷ 2 asks what fit question? (How many 2s fit in 6, which is 3.) · Does 3/4 fit fully inside 2/3? (No, because the divisor is larger than the dividend, so the quotient is less than 1 [1].)

Check understanding: Thumbs up for fit idea and show 6 ÷ 2 = 3 on fingers. Reteach fit language if unsure.

Support: Show two same-size pre-shaded bars for 2/3 and 3/4 to see the divisor is bigger. **Stretch:** Ask students to predict what happens with (3/4) ÷ (1/2) and why it should be greater than 1.

Use: Slides 1-2, 4

7–19 min **Model It** 12 min · Whole class

Teaches interpreting (2/3) ÷ (3/4) with a visual model and equation.

YOU DO

1. Show Slide 4 bullets that division asks a fit question and that quotient x divisor = dividend.
2. Play Slide 5 Video clip 1 (0:00-4:09) about watching how bars are cut into equal parts and writing the model as an equation.
3. Model shading 2/3 on one same-size bar and 3/4 on another, then show the fit is 8/9.
4. Introduce Slide 6 words dividend, divisor, quotient, and reciprocal.

STUDENTS DO

1. Watch the video and follow bar shading with colored pencils.
2. Copy the bars and write (2/3) ÷ (3/4) = 8/9 under them.
3. Repeat the check that quotient x divisor = dividend.

Say: We shade two same-size bars, one for 2/3 and one for 3/4. We ask how many times 3/4 fits into 2/3 [9]. The model pairs with the equation (2/3) ÷ (3/4) = 8/9 to represent the problem [1].

Worked example: (2/3) ÷ (3/4) = 8/9. Bar 1 shows 8 small twelfths shaded for 2/3. Bar 2 shows 9 twelfths for 3/4. The fit is 8 out of 9 parts, so 8/9, which is less than 1 because the divisor is larger than the dividend [1]. Check: 3/4 of 8/9 is 2/3 [1].

Ask: What division does the bar picture show? ((2/3) ÷ (3/4) = 8/9 shown as a visual fraction model [1].) · Why is the answer less than 1 and how do we check it? (The divisor 3/4 is larger than 2/3, so less than one fits; check because 3/4 of 8/9 is 2/3 [1].)

Check understanding: Hold up mini-bars: teacher scans for 2/3 and 3/4 same-size bars and correct equation. Reshow shading if many are off.

Support: Give pre-drawn same-size bars divided into twelfths to shade quickly. **Stretch:** Model (3/4) ÷ (1/2) with bars and explain why the quotient is greater than 1.

Use: Slides 4-6, Video clip 1 (0:00-4:09)

19–30 min **Compute It** 11 min · Whole class

Teaches computing quotients by multiplying by the reciprocal.

YOU DO

1. Show Slide 3 steps: Keep the first fraction as is, Change ÷ to ×, Flip the second fraction to its reciprocal, Multiply across, then simplify.
2. Remind students that dividing by a number is the same as multiplying by its reciprocal [3].
3. Play Slide 7 Video clip 2 (0:00-5:00) and point out simplifying before multiplying.
4. Do Worksheet Task B together, showing the reciprocal step and simplifying.

STUDENTS DO

1. Chant keep-change-flip steps and write the flip step on whiteboards.
2. Solve two Task B problems with a partner, showing the reciprocal step.
3. Check each answer by multiplying divisor times quotient.

Say: Keep the dividend, change division to multiplication, and flip the divisor [3]. Then we turn the second fraction upside down and multiply [12]. A fraction times its reciprocal equals 1, so this keeps the value correct [4].

Worked example: (2/3) ÷ (3/4) = 2/3 × 4/3 = 8/9. Keep 2/3, change ÷ to ×, flip 3/4 to 4/3 [3]. Multiply 2×4=8 and 3×3=9. Simplify is 8/9. Check: 3/4 of 8/9 is 2/3, which explains the quotient [1].

Ask: What is the reciprocal of 3/4 and how do you know? (4/3, because 3/4 × 4/3 = 12/12 = 1 [4][9].) · How do you compute 3/4 ÷ 2/5? (Keep 3/4, change to ×, flip to 5/2, then 3/4 × 5/2 = 15/8 = 1 7/8 [3][12].)

Check understanding: Whiteboards up showing the flip step and product. Correct any flipped first fraction on the spot.

Support: Give a reciprocal chart with pairs like 2/3 and 3/2 to practice flipping first and checking the product is 1 [4]. **Stretch:** Choose cards that need simplifying before multiplying and reduce to lowest terms.

Use: Slides 3, 7, Video clip 2 (0:00-5:00), Worksheet Task B

30–50 min **Main Activity - Make a Story** 20 min · Pairs

Students create and solve story contexts for fraction division with models and equations.

YOU DO

1. Hand out drawing paper, colored pencils, bar outlines, and sentence-frame strips that read: ___ of a jug of paint is left. Each tray needs ___ of a jug. What part of a tray can the helper fill?
2. Show Slide 8 Your task: Sugar: 5/6 cup ÷ 2/3 cup per batch. How many batches? Paint: 2/3 gallon ÷ 3/4 gallon per wall. What part of a wall? Show model, equation, and multiplication.
3. Direct pairs to create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient [1], labeling dividend, divisor, and quotient.
4. Circulate, prompt the multiplication check, and select pairs to post work.

STUDENTS DO

1. Fill the sentence frame, draw and shade bars, and write (2/3) ÷ (3/4) = 8/9.
2. Solve sugar and paint problems with a model, equation, and multiplication check.
3. Post story, model, and equation and explain that 3/4 of 8/9 is 2/3 [1].

Say: Make your own story for (2/3) ÷ (3/4). Draw the same-size bars, write the equation, and label dividend, divisor, and quotient. Then solve the sugar and paint problems. Show model, equation, and multiplication check for each.

Worked example: Sugar: (5/6) ÷ (2/3) = 5/6 × 3/2 = 15/12 = 5/4 = 1 1/4 batches. Keep 5/6, flip 2/3 to 3/2 [3]. Draw 5/6 and 2/3 bars with twelfths, count the fit, write the equation to represent the problem [1]. Check: 2/3 of 5/4 is 10/12 = 5/6 using the relationship between multiplication and division [1].

Ask: What does 8/9 mean in the paint story? (Only 8/9 of one wall or tray can be done because less than one 3/4 fits in 2/3 [1].) · What does the sugar quotient mean? (1 1/4 batches, because 2/3 fits into 5/6 one full time with 1/4 batch left.)

Check understanding: Posted work must show story, same-size model, equation, and check that 3/4 of 8/9 is 2/3 [1]. Pull small group to rescaffold with bars if missing.

Support: Provide a sentence frame with blanks for amount left and amount needed, plus two same-size bars to shade [1]. **Stretch:** Students write a second story where the quotient is greater than 1 and show why it makes sense.

Use: Slide 8

50–60 min **Plenary** 10 min · Whole class

Reviews why quotients can be less or greater than 1 and checks accuracy.

YOU DO

1. Show Slide 9 fact that dividing can make it bigger with 6 ÷ (1/2) = 12, because twelve halves fit in 6 wholes.
2. Lead Slide 10 Think, pair, share: 2/3 ÷ 3/4 = 8/9, less than 1. Why does that make sense?
3. Run Slide 11 Quick quiz for 3/4 ÷ 2/3, 2/5 ÷ 3/7, and the runner problem.
4. Link back to objectives and set Worksheet Task A for homework.

STUDENTS DO

1. Think, pair, and share why 8/9 is less than 1.
2. Answer quiz questions on paper, showing keep-change-flip steps.
3. Self-check against success criteria.

Say: Division does not always make smaller. Twelve halves fit in 6, so 6 ÷ (1/2) = 12. For 2/3 ÷ 3/4 = 8/9, less than one fits because the divisor is bigger. Show your keep-change-flip work and check by multiplying back.

Ask: Why is (2/3) ÷ (3/4) = 8/9 less than 1? (The divisor 3/4 is larger than the dividend 2/3, so less than one full group fits [1].) · What is 3/4 ÷ 2/3? (9/8 or 1 1/8, because 3/4 × 3/2 = 9/8.) · When is a quotient bigger than the dividend? (When dividing by a fraction less than 1, more pieces fit, like 6 ÷ (1/2) = 12.)

Check understanding: Collect quiz slips. If fewer than most show 9/8 and 14/15 correctly, reteach flip of second fraction tomorrow.

Support: Let students use the bar picture and number-line jumps to count the fit before calculating [11].
Stretch: Explain with a model why 7/8 ÷ 3/4 = 7/6 is more than 1.

Use: Slides 9-11

Common mistakes

Mistake	How to spot it	How to fix it
Flipping the first fraction instead of the second	Work shows 3/2 × 3/4 for (2/3) ÷ (3/4)	Restate keep the dividend, change ÷ to ×, and flip the divisor [3]; turn only the second fraction upside down and multiply [12].
Thinking division always makes a smaller answer	Student says 6 ÷ 1/2 must be less than 6	Ask how many halves fit in 6 using circles or a number line to show 10 halves in 5 and 12 halves in 6, so dividing by 1/2 doubles [12].
Insisting on common denominators before dividing	Student rewrites every division with common denominators and stalls	Show the flip method does not require common denominators; only turn the second fraction over and multiply, then simplify [12].

Support

- Provide a sentence frame with blanks for amount left and amount needed, plus two same-size bars to shade [1].
- Keep a reciprocal chart with pairs like 2/3 and 3/2 to check that a fraction times its reciprocal equals 1 [4].

Stretch

- Students write a second story where the quotient is greater than 1 and show why it makes sense.
- Students prove the common-denominator method gives the same answer as the flip method for a new problem.

For the LSE or teaching assistant

Sit with pairs using the sentence frame. Prompt them to point to dividend, divisor, and quotient on bars and to say the check 3/4 of 8/9 is 2/3. Pre-teach reciprocal pairs.

Check for understanding

Question	Answer
3/4 ÷ 2/3 = ?	9/8 or 1 1/8
2/5 ÷ 3/7 = ? Show keep-change-flip.	14/15, because 2/5 x 7/3 = 14/15
A runner has 7/8 mile left. Each lap is 3/4 mile. How many laps is that?	7/8 ÷ 3/4 = 7/6 = 1 1/6 laps

Homework

Complete Worksheet Task A: find each quotient, simplify, and check with multiplication.

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