Grade 5 · Unit 2 · Assessment Guide

Fractions as Quotients and Fraction Multiplication

For the Parent or Teacher — What to look for

Unit 2 builds two crucial fifth-grade ideas: (1) a fraction IS a division — a/b means a divided by b — and (2) multiplying a whole number by a fraction can shrink OR grow the original. Watch for whether the student can move between division, fraction, and area-of-rectangle interpretations.

Problem 1 — 5 children, 3 sandwiches

- Each child gets 3/5 of a sandwich.
- Equation: 3 / 5 = 3/5.
- ★ THE foundational result of this unit. If they answer 5/3 they have swapped numerator and denominator — they're treating it as 'more things than people.'
- Strong drawing: each of 3 sandwiches cut into 5 pieces, one piece given to each child — they get 3 pieces each.

Problem 2 — 7 / 8 vs 9 / 8 without computing

- 9 / 8 is bigger.
- ★ Strong reasoning: 'Same number of sharers (8), but more to share (9 instead of 7), so each share is bigger.'
- Weak: actually computes (defeats the purpose), or thinks 7/8 is bigger because 'the smaller number on top means each piece is bigger' (confused logic).

Problem 3 — Diego vs Sara on 4 / 3

- Diego is correct. 4 / 3 = 4/3 = 1 and 1/3.
- ★ Sara has the classic misconception that division 'turns numbers around' — actually it is the SAME order as the fraction (dividend over divisor).
- Strong: 'Diego is right. The first number (4) stays on top.'

Problem 4 — 6 x 2/3 two ways

- Answer: 12/3 = 4.
- Way 1 (repeated addition): 2/3 + 2/3 + 2/3 + 2/3 + 2/3 + 2/3 = 12/3 = 4.
- Way 2 (using division): 2/3 = 2 / 3, so 6 x (2 / 3) = 12 / 3 = 4. (Or: 6 x 2 = 12, then divided by 3 = 4.)
- ★ Strong: shows BOTH methods and arrives at 4. Reveals the connection between multiplication and division.

Problem 5 — 5 x 3/4

- Answer: 15/4 = 3 and 3/4 miles.
- ★ Strong: writes the equation, shows the multiplication, converts to mixed number cleanly.
- Weak: stops at 15/4 without converting; or computes 5 x 3 = 15 and writes 15 miles.

Problem 6 — Is 8 x 3/5 greater or less than 8?

- LESS than 8 (because 3/5 < 1, multiplying by 3/5 shrinks).
- ★ Strong reasoning: '3/5 is less than 1, so we're taking 3/5 OF 8, not all of 8 — so the result is smaller.'
- ★ This question fights the common kid-belief that 'multiplication always makes things bigger.'

- Weak: says 'greater' because 'multiplication makes things bigger,' OR computes exactly and answers 4.8 but cannot articulate why.

Problem 7 — Distributive: 4 x 2 and 1/2

- Area = (4 x 2) + (4 x 1/2) = 8 + 2 = 10 sq units.
- ★ Strong: explains that you can split the rectangle into a 4x2 piece and a 4x(1/2) piece, find each area, then add.
- Weak: gets the right number but cannot explain WHY decomposing works.

Problem 8 — Pat's misconception: multiplication always shrinks

- Pat is WRONG. Multiplying by a number GREATER than 1 (like 7/3) MAKES IT BIGGER. 5 x 7/3 = 35/3 ≈ 11.67.
- ★ The key principle: multiplying by a fraction < 1 shrinks; multiplying by a fraction > 1 grows.
- Strong: states this rule clearly and gives examples in both directions.
- Weak: agrees with Pat, or cannot articulate when multiplication grows vs shrinks.

Problem 9 — Diagram for 8/5 = 8 / 5

- Each child gets 8/5 = 1 and 3/5 candy bars.
- Strong drawing: 8 bars, each partitioned into 5 pieces. Each child gets 8 pieces, which is 8/5 of a bar.
- ★ Sophisticated answer: 'Each child gets 1 whole bar plus 3/5 of one — so 1 and 3/5 = 8/5.'
- ★ The KEY connection of Unit 2: division of whole numbers can give a FRACTIONAL answer.

Problem 10 — Story for 7 x 2/3

- Answer: 14/3 = 4 and 2/3.
- Strong story: 'There are 7 cups, each 2/3 full of juice. How much juice in total?' or similar — uses fraction OF something repeated 7 times.
- Weak: story does not actually multiply (e.g., 'There are 7 kids and 2/3 of them like pizza' — that is not multiplication of these numbers).

Problem 11 — Error analysis: 6 x 3/8 = 18/48

- Han multiplied the numerators AND the denominators. The correct rule: numerator x whole number, denominator unchanged.
- Correct: 6 x 3/8 = 18/8 = 2 and 2/8 = 2 and 1/4.
- ★ The classic error of treating a whole number as a fraction (6 = 6/1 implicitly) and then 'applying' a wrong multiplication rule.
- Strong: 'Han multiplied the denominator by 6 too, but the denominator (8 — what we're cutting INTO) does not change. Only the count of pieces changes.'

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