Grade 5 · Unit 6 · Assessment Guide

More Decimal and Fraction Operations

For the Parent or Teacher — What to look for

Unit 6 brings together place value (powers of 10, unit conversions), fraction arithmetic with unlike denominators, and the powerful idea of multiplication AS SCALING (i.e., the size of the product depends on the size of the factor relative to 1). Watch carefully for whether the student can REASON about the size of a product without computing — this is the deepest fifth-grade skill.

Problem 1 — Powers of 10

- 10^3 = 1000. 10^4 = 10,000. 100,000 = 10^5.
- Pattern: the exponent equals the number of zeros (when applied to base 10).
- ★ Strong: states the pattern explicitly.
- Weak: gets values right but cannot articulate the pattern.

Problem 2 — Metric conversions

- (a) 500 cm. (b) 3,200 m. (c) 0.85 L. (d) 40 g.
- Larger → smaller: MULTIPLY (1 m = 100 cm, so 5 m = 5 x 100 cm). Smaller → larger: DIVIDE.
- ★ Strong: explains 'you need more of the smaller unit to make the same amount.'
- Weak: confuses direction (e.g., 5 m = 0.05 cm).

Problem 3 — 1/2 + 1/3 with common denominator

- Common denom 6. 1/2 = 3/6. 1/3 = 2/6. Sum = 5/6.
- ★ THE point: you can only add fractions when the SIZE of the parts is the same.
- Strong: 'You need same-sized pieces to combine them — like you cannot add 3 apples and 2 oranges as 5 apple-oranges.'
- Weak: 'because the rule says so.'

Problem 4 — Mixed fraction operations

- (a) 8/12 + 3/12 = 11/12. (b) 5/6 - 4/6 = 1/6. (c) 3 and 1/2 - 1 and 3/4 = 3 and 2/4 - 1 and 3/4 = 2 and 6/4 - 1 and 3/4 = 1 and 3/4.
- ★ Strong: in (c) shows borrowing across whole numbers cleanly.
- Weak: in (c) gets the right whole number but wrong fraction (or vice versa).

Problem 5 — Diego's add-across error

- WRONG. Adding numerators AND adding denominators gives nonsense.
- Correct: 1/3 + 1/4 = 4/12 + 3/12 = 7/12.
- ★ The classic error. If the student does not catch this, they don't understand WHY common denominators are needed.
- Strong: 'If you add denominators, you would be combining different-sized pieces. You have to make them the same SIZE first.'

Problem 6 — Multiplication as scaling (24 x ?)

- (a) LESS (1/3 < 1). (b) GREATER (5/4 > 1). (c) EQUAL (3/3 = 1). (d) LESS (7/8 < 1).
- ★ Rule: comparing the second factor to 1 tells you whether the product is bigger, equal, or smaller than the first factor.

- Strong: states this rule generally.
- Weak: computes each and then compares (defeats the point of estimation).

Problem 7 — 4 x 3/4 miles

- Pat ran 4 miles. Sam ran 3 miles (which is 4 x 3/4).
- ★ Strong: 'Sam ran LESS because 3/4 < 1. Sam ran 3/4 of Pat's distance.'
- Exact: 4 x 3/4 = 12/4 = 3.
- Weak: thinks Sam ran more because the calculation 'looks like multiplication = bigger.'

Problem 8 — Line plot of plant heights

- Most common: 2 and 1/2 inches (3 plants). [Also acceptable: 2 and 3/4 and 3 each have 2.]
- Total: 2.5 + 2.75 + 3 + 2.5 + 3.25 + 2.75 + 3 + 3.5 + 2.5 = 25 and 3/4 inches.
- Strong: organizes the line plot cleanly with marks at 2, 2.25, 2.5, 2.75, 3, 3.25, 3.5, 3.75, 4.
- Weak: misses some data points; mis-counts the 'most common.'

Problem 9 — 2/3 x 1 and 1/2 cups flour

- 2/3 x 3/2 = 6/6 = 1 cup.
- ★ Strong: recognizes that 1 and 1/2 = 3/2 and the product simplifies to 1. Coincidence? No — this shows the inverse-pair structure.
- Weak: gets 6/6 but does not simplify, or multiplies wrong.

Problem 10 — Counterexamples to 'multiplication makes bigger'

- Examples: 8 x 1/2 = 4 (smaller). 10 x 0.3 = 3 (smaller). 1/2 x 1/3 = 1/6 (smaller than both).
- ★ Multiplication makes things bigger ONLY when the multiplier is > 1.
- Strong: gives two CLEAR counterexamples and states the rule explicitly.

Problem 11 — 7/8 x 6/5

- GREATER than 7/8 (because 6/5 > 1).
- ★ Strong: 'We are multiplying 7/8 by something more than 1, so the result is more than 7/8.'
- Weak: computes exactly (defeats purpose) or guesses without reasoning.

Problem 12 — Han's claim about decimal/conversion

- Han is RIGHT about the numeric value (5.2 km = 5,200 m) but his rule statement is incomplete: the decimal moves three places because the conversion factor is 1000 = 10^3.
- ★ Strong: ties decimal movement to the power-of-10 conversion factor — 'moves 3 places because 1000 = 10^3'.
- Weak: agrees with Han's reasoning without verifying, or thinks 5.2 km = 52 m or 520 m.

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