

Grade 4 • Unit 3 • Assessment Guide

Extending Operations to Fractions

For the Parent or Teacher — What to look for

Unit 3 transitions fractions from 'a number on a strip' to 'a number you can operate on.' The key idea is that $a/b = a \times (1/b)$ — every fraction is a multiple of a unit fraction. Watch for whether students operate on fractions structurally (denominator stays, numerators add) or accidentally (add numerators AND denominators).

Problem 1 — Whole $\times$ fraction

- $3 \times 1/4 = 3/4$. $5 \times 1/8 = 5/8$. $4 \times 2/3 = 8/3$ (or $2 \frac{2}{3}$). $6 \times 3/10 = 18/10$ (or $1 \frac{8}{10}$).
- ★ Strong: drawing shows equal groups (e.g., 4 groups of $2/3$ each).
- Weak: writes $4 \times 2/3 = 8/6$ (multiplies both top and bottom). Reveals not understanding the structure.

Problem 2 — 4 plates $\times$ $1/3$ sandwich each

- Expression: $4 \times 1/3 = 4/3$ (or $1 \frac{1}{3}$).
- Strong: identifies 'plates' as the whole-number factor.
- Weak: writes $4 \times 1/3 = 1/12$ (multiplies into denominator).

Problem 3 — Sums and differences with like denominators

- $3/8 + 4/8 = 7/8$. $5/6 - 2/6 = 3/6$ (or $1/2$). $7/10 + 5/10 = 12/10$. $2 - 3/4 = 5/4$ (or $1 \frac{1}{4}$). $1 \frac{1}{4} + 2/4 = 1 \frac{3}{4}$.
- ★ Watch $2 - 3/4$: weak students give a negative answer or ignore the 2. Strong: rewrite $2 = 8/4$.
- Watch $7/10 + 5/10$: do they recognize $12/10 > 1$?

Problem 4 — $5/6 + 4/6$ on number line

- Sum = $9/6 = 1 \frac{3}{6}$ (or $1 \frac{1}{2}$).
- Strong: shows two jumps ending past 1.
- Weak: just computes $9/6$ without drawing; OR draws but doesn't go past 1.

Problem 5 — Decompose $11/8$ two ways

- Many: $5/8 + 6/8$; $4/8 + 7/8$; $1/8 + 10/8$; $8/8 + 3/8$ (especially useful for converting to mixed number).
- $11/8 = 1 \frac{3}{8}$.
- ★ Strong: at least one decomposition uses $8/8$ (a whole).
- Weak: both decompositions are minor variants; doesn't get the mixed number.

Problem 6 — Tenths + hundredths

- $3/10 + 25/100 = 55/100$. $7/10 + 4/100 = 74/100$. $6/10 + 50/100 = 110/100$ (or $1 \frac{10}{100}$).
- ★ Diagnostic: do they rewrite $6/10$ as $60/100$ (correct) or $6/100$ (place-value error)?

Problem 7 — Why $4/10 = 40/100$

- Strong: 'There are 10 hundredths in every tenth. So 4 tenths = $4 \times 10 = 40$ hundredths.' OR refers to a 10×10 grid.
- Weak: 'Because you multiply by 10' — knows procedure but can't justify.

Problem 8 — Diego's $3/5 + 2/5 = 5/10$ error

- Correct: $5/5 = 1$. Diego added the denominators.
- ★ THE classic error — extremely diagnostic.
- Strong: 'The denominator doesn't change. You're adding pieces of the SAME size: 5 fifths = 1 whole.'
- Weak: 'He should have gotten $5/5$ ' but can't say why the 10 is wrong.

Problem 9 — Story for $3 \times 2/5$

- $3 \times 2/5 = 6/5$ (or $1 \frac{1}{5}$).
- Strong: clear story (e.g., 'There are 3 pizzas. Each is $2/5$ cheese. How much is cheese?').
- Weak: story doesn't involve multiplication; or answer doesn't match story.

Problem 10 — $2 \frac{1}{4} - 3/4$ two ways

- Answer: $1 \frac{1}{2}$ (or $6/4$).
- Way 1 (number line): start at $2 \frac{1}{4}$, jump back $3/4 \rightarrow$ lands at $1 \frac{1}{2}$.
- Way 2 (decomposition): $2 \frac{1}{4} = 1 + 5/4$. Then $5/4 - 3/4 = 2/4$. Final: $1 + 2/4 = 1 \frac{1}{2}$.
- ★ The CORE 'borrow' problem for fractions. Strong: decomposes the $2 \frac{1}{4}$. Weak: subtracts numerators leaving nonsense.

Problem 11 — Are $4 \times 3/8$, $3/8 + 3/8 + 3/8 + 3/8$, and $12/8$ equal?

- Yes, all $12/8$.
- Strong: 'multiplication is repeated addition; multiplying the numerator by 4 keeps the unit (eighths) the same.'
- Weak: agrees but can't articulate WHY the numerator gets multiplied while the denominator stays.

Problem 12 — Line plot total length

- Total: $2 \times 3/8 + 3 \times 4/8 + 1 \times 6/8 + 2 \times 7/8 = 6/8 + 12/8 + 6/8 + 14/8 = 38/8 = 4 \frac{6}{8} = 4 \frac{3}{4}$ inches.
- Strong: organizes the calculation cleanly.
- Weak: forgets to multiply by the count; arithmetic errors with eighths.

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