

Grade 5 • Unit 4 • Assessment Guide

Wrapping Up Multiplication and Division with Multi-digit Numbers

For the Parent or Teacher — What to look for

Unit 4 cements the STANDARD ALGORITHM for multiplication and partial-quotient strategies for division. The diagnostic is whether the student understands the place-value reasoning *BEHIND* the algorithm — what each digit and zero represent — and can estimate to catch their own errors.

Part A — Mental estimates

- $27 \times 38 \approx 30 \times 40 = 1200$ (actual 1026). $412 \times 19 \approx 400 \times 20 = 8000$ (actual 7828).
- $856 / 22 \approx 900 / 20 = 45$ (actual 38 r 20). $1250 / 48 \approx 1200 / 50 = 24$ (actual 26 r 2).
- ★ Strong: rounds to nearby compatible numbers. Weak: tries to compute exactly (defeats the purpose), or rounds in ways that don't simplify the calculation.

Problem 1 — 263 x 24 standard algorithm

- Answer: 6,312.
- Estimate: $263 \times 24 \approx 250 \times 25 = 6,250$ or $300 \times 20 = 6,000$.
- ★ Strong: result is close to estimate (within 10%).
- Common errors: forgetting the placeholder 0 when multiplying by the tens digit; arithmetic slips in carrying.

Problem 2 — 145 x 38 two ways

- Answer: 5,510 both ways.
- Standard algorithm: $145 \times 8 = 1,160$; $145 \times 30 = 4,350$. Sum = 5,510.
- Partial products: $(100+40+5)(30+8) = 3,000 + 800 + 1,200 + 320 + 150 + 40 = 5,510$.
- ★ Strong: both methods agree; student articulates a clear preference with reasoning.

Problem 3 — Sara's work on 264 x 38

- $264 \times 8 = 2,112$. ✓ This matches Sara's first partial product.
- Second partial product: $7,920 = 264 \times 30$ (the '3' in 38 is really 30).
- Final answer 10,032 is CORRECT.
- ★ The diagnostic: does the student realize the '3' is actually 30 because of place value? If they say $264 \times 3 = 792$, they don't understand the algorithm.

Problem 4 — 532 / 14 with partial quotients

- Answer: 38 remainder 0.
- Sample partial quotients: $14 \times 30 = 420$; $532 - 420 = 112$; $14 \times 8 = 112$; remainder 0. Total quotient: $30 + 8 = 38$.
- Check: $38 \times 14 + 0 = 532$. ✓
- ★ Strong: choices of multipliers (30, 8) are efficient and use friendly numbers.

Problem 5 — Han's bounding for 936 / 24

- Han's reasoning is CORRECT. $24 \times 10 = 240$; $24 \times 40 = 960$. So $936 / 24$ is between 30 and 40.
- Exact answer: 39 (since $24 \times 39 = 936$).
- ★ Strong: confirms the bound, then narrows down. Demonstrates how estimation supports exact computation.

- Weak: doesn't trust the bounding and just guesses.

Problem 6 — 712 students / 48 per bus

- $712 / 48 = 14$ remainder 40.
- ★ Need 15 buses (not 14) — must round UP because the remaining 40 students still need a bus.
- ★ Strong: explicitly addresses why rounding UP is required in this context.
- Weak: answers 14 buses (leaving 40 students behind) or 14.something (ignoring the context).

Problem 7 — 4 trucks x 2 trips x 24 boxes

- Capacity: $4 \times 2 \times 24 = 192$ boxes in 2 trips. Yes, they can move 175 boxes!
- ★ Strong: organized work, sees the multi-step structure.
- Weak: tries to divide 175 by 24 first (a valid but harder path), or mis-applies the multiplications.

Problem 8 — The 0 in standard algorithm

- The 0 in 940 (from 47×23) represents that we're really multiplying 47×20 , not 47×2 .
- The '2' in 23 has a place value of 20.
- ★ THE diagnostic of standard-algorithm understanding. If they can't explain why the 0 is there, they're memorizing not understanding.
- Strong: clearly connects the 0 to place value of the tens digit.

Problem 9 — Pat's $588 / 28 = 11 \text{ r } 20$

- $11 \times 28 = 308$. $308 + 20 = 328 \neq 588$. So Pat is WRONG.
- Actual: $588 / 28 = 21$ (since $28 \times 21 = 588$).
- ★ The diagnostic: does the student CHECK by multiplying? This is a core habit of mind for division.
- Strong: catches Pat's error AND finds the correct answer.

Problem 10 — Write your own multi-digit story

- Strong: coherent, realistic setup; correct numerical answer (check it!).
- Examples: 'A school has 24 classrooms, each with 32 students...' (768), or 'A factory makes 145 widgets a day, for 28 days...' (4060).
- Weak: numbers don't multiply correctly; or the situation doesn't actually require multiplication.

Problem 11 — Zero property and division

- True: anything $\times 0 = 0$.
- $1000 / 50 = 20$ (division by NON-zero is fine; division by zero is undefined).
- ★ The trick: division is the INVERSE of multiplication. They're related but not the same.
- Strong: notices that division and multiplication are inverses but not identical operations.