

Grade 4 • Unit 5 • Assessment Guide

Multiplicative Comparison and Measurement

For the Parent or Teacher — What to look for

Unit 5 introduces 'times as many' (multiplicative comparison) as distinct from 'how many more' (additive comparison) — a big conceptual shift. Watch for whether students truly distinguish the two and use multiplicative thinking to convert measurement units.

Problem 1 — 3 times as many as 4

- Lin has 12 stickers. $3 \times 4 = 12$.
- ★ Strong: diagram shows Lin's bar as THREE COPIES of Mai's bar.
- Weak: draws longer bars without showing the multiplicative relationship.

Problem 2 — Diego/Sara, finding the factor

- 7 times as many. $35 \div 5 = 7$.
- ★ The 'unknown FACTOR' type. Strong: writes $? \times 5 = 35$ and recognizes it as division.
- Weak: subtracts ($35 - 5 = 30$); confuses with additive comparison.

Problem 3 — 8 times as far

- $8 \times 240 = 1,920$ meters.
- Strong: tape diagram with 8 equal bars OR clean multiplication.
- Weak: multiplies wrong (e.g., drops a zero).

Problem 4 — Marbles: additive vs. multiplicative

- More: $18 (24 - 6)$. Times: $4 (24 \div 6)$.
- ★ Strong explanation: 'How many more = the gap. How many times = how many copies fit inside.'
- Weak: gets same answer for both, revealing they don't distinguish the question types.

Problem 5 — Sara's claim about 6 and 3

- Sara is WRONG. 6 is 3 MORE than 3 (correct), but 6 is 2 TIMES as much as 3 (NOT 3 times).
- ★ Strong: catches Sara's error in the 'times' part — sees that 'how many more' and 'how many times' generally don't give the same answer.
- Weak: agrees with Sara — hasn't internalized that 'how many times' is about division/factor, not addition.

Problem 6 — Unit conversions

- $3 \text{ m} = 300 \text{ cm}$. $2 \text{ km} = 2,000 \text{ m}$. $4 \text{ kg} = 4,000 \text{ g}$. $5 \text{ L} = 5,000 \text{ mL}$. $2 \text{ ft} = 24 \text{ in}$. $3 \text{ hr} = 180 \text{ min}$.
- ★ Diagnostic: $2 \text{ ft} = 24 \text{ in}$ ($\times 12$, NOT $\times 100$). Tests whether student understands the conversion factor.
- $3 \text{ hr} = 180 \text{ min}$ ($\times 60$). Same diagnostic — non-metric, non-power-of-10.

Problem 7 — Generalize Diego's pattern

- Examples: '1 L = 1,000 times mL.' '1 kg = 1,000 times g.' '1 m = 100 times cm.' '1 hr = 60 times min.'
- ★ Strong: uses 'times as' language consistently with the correct factor.
- Weak: says '1 km = 1,000 m' without the multiplicative comparison framing.

Problem 8 — Dog weight ($14 \text{ lb} \times 3 \rightarrow \text{oz}$)

- Pat's dog: $14 \times 3 = 42$ lb. In ounces: $42 \times 16 = 672$ oz.
- ★ Two-step. Strong: clear sequence. Weak: only does one step.
- Be lenient on the 42×16 multiplication if structure is right.

Problem 9 — Scaled rectangle perimeter

- Original perimeter: $2(4+3) = 14$ cm. Scaled: $20 \text{ cm} \times 15 \text{ cm}$; perimeter = $2(20+15) = 70 \text{ cm} = 0.70 \text{ m}$ (or $7/10 \text{ m}$).
- ★ Strong: scales BOTH dimensions. Even better: notices new perimeter is $5 \times$ the original ($14 \times 5 = 70$).
- Weak: only scales one dimension.

Problem 10 — Han's $6 \text{ m} + 200 \text{ cm} = 206 \text{ m}$

- WRONG. $200 \text{ cm} = 2 \text{ m}$. So $6 \text{ m} + 2 \text{ m} = 8 \text{ m}$.
- ★ Strong: identifies the missing conversion.
- Weak: accepts the answer or 'put a decimal somewhere.'

Problem 11 — Bigger unit $\leftrightarrow$ fewer units

- Strong: 'A meter is BIGGER than a centimeter, so it takes FEWER meters to measure something. $10 \text{ m} = 1,000 \text{ cm}$ — same length.'
- Weak: 'because it's bigger' (circular).
- ★ Reveals inverse-relationship intuition.

Problem 12 — Write a story for 'Andre has 32 books'

- Example: 'Andre has 4 times as many books as Mai. Mai has 8 books.' Answer: 32.
- Strong: story actually uses multiplicative comparison.
- Weak: 'Andre has 32 books' (just states it); or uses only addition.

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