Grade 3 · Unit 1 · Assessment Guide

Introducing Multiplication

For the Parent or Teacher — What to look for

Unit 1 introduces multiplication through scaled graphs and equal groups. Watch for whether the student sees multiplication as 'number of groups × size of each group,' not just as a memorized fact. The single biggest diagnostic is whether they can move between representations: a graph, a story, an array, and an equation.

Problem 1 — Scaled picture graph (Cleo, Adia, Ben…)

- Each book symbol = 5 books. (a) Cleo: 5×5 = 25 books. (b) Adia 20, Ben 10, difference = 10. (c) Total: 20+10+25+15 = 70 books.
- ★ Diagnostic: do they MULTIPLY by 5, or do they count books one-by-one as if the scale were 1? A student who answers (a) with '5' (number of pictures) hasn't internalized the scale.
- (d) Strong: 'Yes — Cleo would still have the most because she has the most pictures, no matter what each picture is worth.' Reveals understanding that ordering is preserved by the scale.

Problem 2 — Build a scaled bar graph (Lin's field trip)

- Bars: Zoo 12, Museum 8, Aquarium 18, Park 6. Each gridline = 2.
- Strong: bars land between gridlines for the odd-multiples-of-2 values; bars labeled; scale labeled.
- ★ Why scale of 2: a strong answer says 'because 18 wouldn't fit nicely on a scale of 1 — too many lines.' A weak answer says 'because the teacher said to.'
- Student-written question: should be ANSWERABLE from the graph (e.g., 'How many more chose the aquarium than the park?').

Problem 3 — Draw 4 groups of 3, write equation

- Picture: 4 distinct groups, 3 stars in each. Equation: 4 × 3 = 12.
- ★ The interpretation matters. Strong: '4 means 4 groups; 3 means 3 stars in each group; 12 means the total.' This is the heart of the equal-groups concept.
- Weak: writes 3 × 4 because 'order doesn't matter' without explaining what each number means in the situation.

Problem 4 — Han's equation 5 × 2 = 10

- 5 = number of plates (number of groups). 2 = apples per plate (size of each group). 10 = total apples.
- ★ This is the bedrock interpretation. If they confuse 5 and 2 (saying 5 = apples per plate), they're matching numbers to words without understanding the structure.
- In IM's convention, 5 × 2 means '5 groups of 2,' so the meaning here is precise.

Problem 5 — 3×6 array (rows and columns)

- Total: 18. Rows: 3 × 6 = 18 (3 rows of 6). Columns: 6 × 3 = 18 (6 columns of 3).
- ★ THE commutative-property question. Strong: 'Both equations equal 18 because it's the same dots, just counted a different way.' This is a key Section C insight.
- Weak: only sees one equation, OR writes 3+3+3+3+3+3 without recognizing the multiplication structure.

Problem 6 — Draw 4 × 7 array

- 4 rows of 7 dots = 28. Should be a clear rectangular array.

- ★ Strong: 'Yes, 7 × 4 also works because rows and columns just swap roles — the total is the same.' Commutativity again.
- Weak: draws unequal rows; or says 'no, 4×7 is different from 7×4' (still pattern-matching by name).

Problem 7 — Mai: '6 × 4 > 4 × 6 because 6 is bigger'

- Mai is WRONG. 6 × 4 = 4 × 6 = 24. They are equal (commutative property).
- ★ Strong: 'They are equal — 6 groups of 4 and 4 groups of 6 both give 24. You can rearrange the same dots into either shape.' A picture/array argument is the strongest.
- Weak: 'no, they're the same' without saying why; OR agrees with Mai (most diagnostic — means commutativity hasn't clicked).

Problem 8 — Missing factor: 18 = ? × 3

- 3 = the size of each group (3 in each group). ? = the number of groups. ? = 6.
- ★ This is a 'how many groups?' situation — a preview of division in Unit 4.
- Strong: can identify what each number represents AND solve. Weak: solves correctly (6) but can't say what 3 or ? mean in context.

Problem 9 — Write a story for 5 × 6 = 30

- Should be an equal-groups story: '5 boxes with 6 crayons in each — how many crayons in all?'
- ★ Inverse direction: from equation to situation is the deepest test.
- Weak: not actually multiplicative ('Sam has 5, then he gets 6 more, then… 30'); OR numbers don't match.

Problem 10 — Bar past 25 but not at 30 (scale of 5)

- Reasonable: 26, 27, 28, or 29. Strong: 'The bar is past 25 but not at 30, so it must be between 26 and 29.'
- Could it be 27? Yes. Could it be 23? NO — that would be below 25.
- ★ Reveals whether they can read between scale lines and reason proportionally about scale.

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