Teacher guidance

Key focus

This objective is the second of a planned 10-LO series of substantial, realistic measurement problems – LO1 (Measurement applications: simple shapes) covered single named shapes only; this LO's whole point is compound-shape decomposition. Every question presents a real NZ context (an L-shaped deck or floor plan, a floor plan or lawn with an excluded region such as a fireplace hearth or a garden bed, a wall/gable/sign/garden feature combining a rectangle, square, or parallelogram with a triangle, semicircle, or quarter-circle) where students must first split the figure into simpler component shapes – or identify an excluded region to subtract – before finding a total area or perimeter, then chaining that through a unit conversion, a quantity of material, a discrete purchase, and a cost, sometimes finishing in a justified decision between two options. The goal is to extend LO1's single-shape fluency to genuine compound figures, so every problem should still feel like a real task a person would actually need to do.

Suggested teaching sequence

1. Revise splitting a compound shape into simpler component shapes (rectangles, triangles, parallelograms, semicircles, quarter-circles), and identifying an excluded region that must be subtracted instead of added (a hole, a void, a garden bed cut out of a lawn). Stress that students must decide, for each compound shape, whether they are adding pieces together or subtracting a piece from a larger one.
2. Model the full chain on one worked example (e.g. the worksheet's shed-wall primer example): split the shape, find each component area, add (or subtract), then use the total to find a quantity of material, then a cost – carrying units through every line.
3. Teach perimeter of a compound shape explicitly: only the TRUE outer boundary counts. The dashed internal line where two shapes are glued together is never part of the perimeter, and a curved edge (a semicircle or quarter-circle arc) contributes an arc length, not a straight one.
4. Revise unit conversion within a problem, and the "round UP for a whole-item purchase" rule from LO1 – both apply here exactly as before, just applied to a compound shape's total area or perimeter instead of a single shape's.
5. Move to Proficient-style problems where the split (or the excluded region) is still shown, but the steps to area/perimeter, quantity, and cost are not spelled out.
6. Finish with Excellence-style problems that compare two real options, apply a constraint (a budget or a free-delivery threshold), and require a written, justified recommendation – as in LO1, discuss that the cheaper option is not always the same as the better-value option, and a written justification must reference the actual numbers.

Worked model: an excluded region, not a compound addition

A rectangular lawn measures 12 m by 8 m. A rectangular garden bed measuring 4.5 m by 3 m sits inside the lawn and will not be turfed. New turf costs $18 per m^2, and can only be bought in whole square metres.

- **Outer area:** $12 \times 8 = 96$ m^2.
- **Excluded area:** $4.5 \times 3 = 13.5$ m^2.

- **Subtract (not add):** $96 - 13.5 = 82.5$ m^2 of lawn actually needs turf.
- **Round UP to a whole m^2:** 83 m^2.
- **Cost:** $83 \times \$18 = \$1494.00$.

Watch for

- Adding an excluded region's area instead of subtracting it – a hole, void, or garden bed cut out of a larger shape reduces the usable area, it does not add to it.
- Including the internal dashed split line (where two component shapes are glued together) as part of the perimeter – it is never part of the true outer boundary.
- Treating a curved edge (a semicircle or quarter-circle arc) as if it were a straight side when calculating perimeter – it needs the arc-length formula (πr for a semicircle, $\frac{1}{2}\pi r$ for a quarter circle), not a plain measured length.
- Converting units *after* calculating a compound shape's area instead of before – every component must be in the same unit before its area is found, and the area conversion factor is squared (e.g. cm^2 to m^2 divides by $10\,000$, not 100).
- Rounding a whole-item purchase to the *nearest* whole number instead of rounding UP, exactly the same trap as LO1.
- In a comparison/decision question, naming an option without justifying it with the actual numbers (cost, value per unit area, or whether a constraint like a budget or a free-delivery threshold is met).

Checks for understanding

- Can students identify how a compound shape is built from simpler component shapes, and correctly decide whether a region should be added or subtracted?
- Can they calculate the area of a compound shape by summing component areas, or by subtracting an excluded region from an outer shape?
- Can they calculate the perimeter of a compound shape using only the true outer boundary, correctly including a curved edge's arc length and excluding any internal split line?
- Can they convert a length or area to the unit needed for a given rate before calculating, remembering that area conversion factors are squared?
- Can they use a calculated area or perimeter to find a quantity of material and then a total cost, rounding UP for a whole-item purchase and money to the nearest cent?
- Can they compare two real options against a stated constraint and write a justification that references the specific numbers involved?