Lesson 52 MEASURES

Relationship between area units (cm^2 to m^2)

CURRICULUM ALIGNMENT

MEA.MSR.4a determine and calculate units of measurement in fractional and/or decimal form to solve practical problems.

ALG.PRR.4a identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

INTERACTIVES Area Model · display | Unit Converter · challenge, explore

WHAT THIS LESSON TEACHES

A square 1 m on each side has area 1 m^2. Because 1 m = 100 cm, one square metre holds 100 × 100 = 10 000 little squares each 1 cm^2.

→ A 1 m × 1 m square drawn on the floor with chalk has area 1 m^2 = 10 000 cm^2.

→ A postage stamp covers roughly a few cm^2.

MODEL THIS ON THE BOARD

CONVERT 3 M^2 TO CM^2

1. Draw a square 1 m on each side.
2. Along one edge write 1 m = 100 cm.
3. The square is filled with rows of 1 cm squares.
4. One row holds 100 little squares.
5. There are 100 such rows, so total 100 × 100 = 10 000 cm^2.
6. Therefore 3 m^2 = 3 × 10 000 = 30 000 cm^2.

LESSON ARC

Open with the one-metre square as a puzzle — pupils predict how many cm^2 fill it, and you let a wrong '100' hang without correcting. Fill the grid on the IWB so the class sees 100 rows of 100, and the pivot lands: 100 × 100, not 100. The edge ladder confirms m↔cm is ×100/÷100, then you step off it to work area conversions by hand. Copybook practice writes each area in both units with a labelled arrow; the tiling problem ties 10,000 to a real job.

TEACHING MOVES

1. **Getting Started.** Take three hands-up answers for the edge (expect 100 cm), then deliberately let the whole-square question hang — do not confirm. When you hear '100' for the total, note it silently; that wrong prediction is exactly what the grid in the next step will overturn.
2. **Watch and Notice.** Hold on the first grid and ask 'how many along one row, how many rows?' before revealing the product. Say aloud: 'the length scaled by 100 and the breadth scaled by 100, so the area scaled by 100 twice.' On the 2 m^2 grid, point out the two separate squares and get a prediction before you reveal — re-voice any pupil who says 'double 10,000'.
3. **Try It Together.** Run the edge ladder both ways (1 m → 100 cm, then back) so pupils see ×100 / ÷100. Then say clearly you're stepping off the ladder — it can't show area units — and work the four area conversions by hand at the board. On 0.5 m^2, hold out for the prediction: the common slip is 50,000; the answer is 5,000, exactly half of 10,000.

4. **Write Both Units in Your Copy.** Walk the room glancing only at the arrow direction and the factor beside it — no individual marking. The slip to catch on the spot is a pupil writing ×100 instead of ×10,000; stop that one immediately and point back at the filled grid.
5. **Class Challenge.** Keep the three edge rounds (4.2 m → 420 cm, 250 cm → 2.5 m, 3.5 m → 350 cm) brisk — pupils take turns at the board and the class confirms each before moving on. For the tiling problem, let a pupil reason 10,000 ÷ 625 = 16 aloud before you confirm; that's the beat that ties the 10,000 fact to a real building job.
6. **What Did We Notice?.** Ask 'what does the second 100 come from?' and listen for pupils naming both the length scaling and the breadth scaling. Re-voice a strong answer: 'the 100 happens twice, once along and once up, and 100 times 100 is 10,000.'
7. **1 m^2 as 10,000 cm^2.** Last look at the fact the lesson turns on. Ask the class to name the two edges (100 and 100) and the product (10,000) before you point at it — pupils call out each move and explain their thinking.

COMMON MISCONCEPTIONS

⚠ '1 m^2 is 100 cm^2' — pupils carry the edge factor straight over to the area, since a metre is 100 cm along one side.

Point back at the filled grid on the IWB: 100 squares in a row is only ONE row, and there are 100 rows. Get the class to count '100, 200, 300...' down the rows so the second 100 becomes visible, then land 100 × 100 = 10,000.

⚠ For 0.5 m^2 a pupil answers '50,000 cm^2' — they multiply the half-metre as though halving made it bigger, or they lose track of the zeros.

Hold out for the prediction before confirming. Then reason it as half of a whole square metre: 10,000 ÷ 2 = 5,000. Point at the grid — half the square holds half the little squares.

⚠ In the copybook, pupils label the conversion arrow ×100 instead of ×10,000 — the edge rule has stuck harder than the area rule.

Catch it on the spot as you walk the room. Ask the pupil 'is that an edge or a whole area?' and send them back to the filled grid to recount before they fix the factor on the arrow.

DIFFERENTIATION

EMERGING

- Keep these pupils on the fully-filled 1 m^2 grid throughout — have them count and label just the first three rows, so the 'rows of 100' idea lands physically before any multiplication.
- In the copybook, give them only the 3 m^2 = 30,000 cm^2 line and ask them to draw the arrow and write the factor, rather than converting all four values.

DEVELOPING

- After the four board conversions, ask them to find 7.5 m^2 in cm^2 and justify the half-square step out loud.
- Pose 60,000 cm^2 and ask for the m^2 answer, then 'how would you check it makes sense against 1 m^2 = 10,000 cm^2?'

PROFICIENT

- During the Class Challenge, narrate a harder tiling variant for them: how many 20 cm × 20 cm tiles cover 1 m^2, and does the number of tiles go up or down when the tile shrinks? Ask them to predict before working it.
- Ask them to explain to the class why km^2 to m^2 would be ×1,000,000 — extending the 'square of the length factor' rule to a unit the lesson didn't cover.

↗ **Cross-curricular:** Link to STE materials work — pupils cost tiling or flooring for a real classroom or hall space, converting the room's m^2 into cm^2 to count tiles.

ANSWER KEY

Scaffold: visual check on the page

Q1: 30,000 cm^2

Q2: 20,000 cm^2

Q3: 10,000 cm^2

Q4: $4.5\ m^2$

Q5: $7\ m^2$

Q6: $1\ m^2$

a) Always — Because 1 m = 100 cm so *area* multiplies by 100 × 100.

b) Never — 5 m^2 is always 50 000 cm^2, never sometimes.

c) Always — The conversion factor is fixed at 10 000.

d) Never — 25 000 cm^2 is always exactly 2.5 m^2.

EXTENSION SHEET · STRETCH ANSWERS

S1: $12\ m^2$

S2: $3\ m^2$

S3: $3\ m^2$

S4: 0.981 kg

S5: 0.892 l