

Estimating and measuring the area of irregular shapes

CURRICULUM ALIGNMENT

MEA.MSR.4b

find, interpret and deduce measures experimentally with increasing precision.

NUM.FRC.4a

explore (model, compare and convert) the relationships between fractions, decimals and percentages.

WHAT THIS LESSON TEACHES

To estimate the area of an irregular shape count whole squares inside then add part-squares using the more-than-half rule.

- A leaf covers 20 whole squares and 7 part-squares.
- A paw print covers 15 whole squares and 5 part-squares.

MODEL THIS ON THE BOARD

ESTIMATE A LEAF AREA ON GRID

- 1 Count all whole squares inside the outline: there are 24.
- 2 Count part-squares along the edge and keep only those more than half full: there are 8.
- 3 Add the totals to get the estimated area: 24 plus 8.

LESSON ARC

Open with the curved leaf on a centimetre grid and take two or three hands-up ideas for finding its area when length $\times$ breadth will not work. Model counting whole squares first, then the more-than-half rule (or pairing half-covered squares) on the annotated leaf diagram. Class estimates one leaf together at the board with two running tallies. Pupils trace an irregular shape onto squared paper in their copy and split whole vs part-square columns. Class Challenge: stone, leaf, then own hand on squared paper at desks. Close on why the edge makes every total an estimate.

TEACHING MOVES

1. **Getting Started.** Show the leaf on the centimetre grid. Ask how we could find the area when there are no straight sides. Take two or three hands-up ideas only — do not resolve yet. If someone says ‘count the squares’, park it: ‘that is exactly where we are heading.’
2. **Watch and Notice.** On the annotated leaf diagram (not the shape tool — it only draws straight edges), count whole squares aloud and deliberately hesitate on easy-to-miss ones so pupils catch skips. Give the edge rule: more than half counts as one; less than half is left out. Point to a barely-clipped square and a clearly-over-half square and ask the class which counts. Explain the cancel: nearly-full squares over-count a little, barely-covered ones under-count a little. Offer pairing two half-squares as a second route. Ask for a rough prediction before you announce the total.
3. **Try It Together.** One leaf together. Split into two tallies on the board: whole squares first, then part-squares. Pupils take turns pointing; the class must call ‘more than half — does it count?’ for each edge square, then pair leftover halves aloud. When totals differ by a square or two, name both as fair estimates.
4. **Trace and Tally in Your Copy.** Pupils trace one irregular shape onto 1 cm squared paper (or the copy’s squared pages) and make two columns: whole squares and part-squares under the more-than-half rule.

Walk the room glancing at the split — this is practice, not marking. Watch for every clipped square being counted as whole.

5. **Class Challenge.** Keep it brisk at desks: freehand stone, freehand leaf, then own hand traced fingers-spread. Circulate for two slips — barely-clipped squares counted whole, and unpaired halves. When a pupil re-counts their hand and gets a slightly different total, bring that case to the class as living proof this is an estimate. Confirm each shape's estimate aloud at the end.
6. **What Did We Notice?.** Ask why the area is always an estimate, and whether two careful counters would match exactly. Listen for part-squares as the wobble. Re-voice: 'the whole squares are certain; the edge is where the estimate lives.'

COMMON MISCONCEPTIONS

⚠ Pupils count every clipped edge square as a whole: 'it touches the leaf, so it counts.'

Freeze on one barely-nicked square on the board leaf. Ask 'more than half, or less?' Drop it. Contrast with a square clearly past halfway that does count. Restate: touch is not enough — coverage past halfway is the test.

⚠ Pupils list part-squares but never pair them, so halves sit unused or each half is wrongly added as 1.

Trace two about-half squares on the diagram and say aloud 'this one and that one make one whole together.' Add +1 to the running total only after the pair is named.

⚠ Pupils think two careful counters must get the identical total, so a one-square difference means someone is wrong.

Bring a hand re-count that shifted by a square. Re-voice: whole squares stay fixed; judging the edge is where estimates honestly differ — both can still be fair.

DIFFERENTIATION

EMERGING

- Give a simple rounded blob with few edge squares; pre-mark the obvious whole squares so the pupil only judges the edge with the more-than-half rule.
- Stay beside them for the first three edge squares: point and ask 'more than half?' before they tally alone.

DEVELOPING

- After the copybook shape, ask them to mark one edge square they nearly counted and write one sentence why it stayed out.
- On the leaf challenge shape, demand an explicit pair list ($\frac{1}{2} + \frac{1}{2} \rightarrow 1$) before the final cm^2 total.

PROFICIENT

- After the hand estimate, ask: if the grid were $\frac{1}{2}$ cm squares instead, would your estimate get closer to the true area — and why? Note the answer in the copy without needing a finer grid in front of them.
- Challenge: find two different freehand leaves that both estimate to the same cm^2 total; explain how the edge judgements still allow a match.

✓ **Cross-curricular:** Science or Geography: trace a real leaf, or the outline of an Irish county on a map grid, and estimate its area in cm^2 the same way.

ANSWER KEY

a) 51 cm^2

b) 25 cm^2

c) 20 cm^2

Q1: 17.5 cm^2

Q2: $30\frac{1}{2} \text{ cm}^2$

Q3: 17.5 cm^2

Q4: 42.5 cm^2

Q5: 56 cm^2

a) **Never** : The curved edge cuts through squares, so counting part-squares gives an estimate.

b) **Sometimes** : They may agree. Borderline part-squares can also differ.

c) **Never** : Only part-squares more than half are counted.

d) **Always** : Each full square inside the shape adds one to the total.

EXTENSION SHEET · STRETCH ANSWERS

S1: 63.89 m^2

S2: 168 m^2

S3: 240 m^2

S4: 306 m^2

S5: 201 m^2