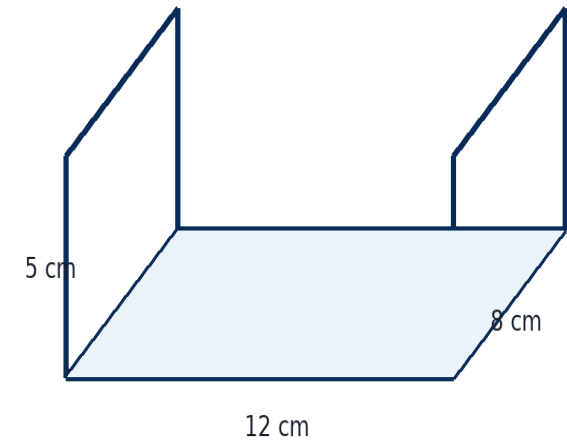


SURFACE AREA AND VOLUME

GCSE Mathematics 1MA1 · L036 · 60 minutes

Week 12 · Reach for the Star Gold Standard

Open-top box: distinguish capacity from exposed area



No top face in surface area. Volume still uses base area $\times$ height.

Objective and lesson route

Connect & Check

By the end of the lesson you will:

- find surface area from nets/faces
- find volume from an appropriate formula
- distinguish exposed area from capacity
- use square and cubic units correctly

Running order

- Connect & Check · 5 min
- Share · 5 min
- Present · 12 min
- Apply · 25 min
- Recall & Review · 8 min

NC = non-calculator · C = calculator. Keep π exact unless a decimal answer is requested.

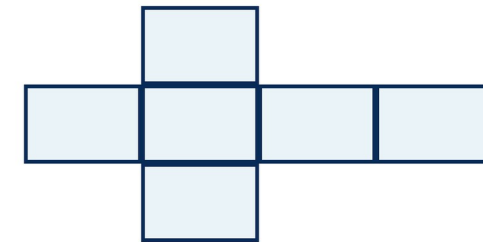
Baseline: what do you already know?

Connect & Check

Work independently · 5 minutes

- C1 [NC] A cuboid is $8\text{ cm} \times 5\text{ cm} \times 3\text{ cm}$. Find its volume.
- C2 Explain the difference between surface area and volume. Include the type of units for each.

Cuboid net: every exposed face counts once



8 cm 5 cm 3 cm

Surface area uses square units; volume uses cubic units.

Keep this response. You will compare it with the exit task.

Choose your route

[Share](#)

Same destination. Different journey.

A · Visual

Sketch/label a net before calculating.

B · Method

Use a face table or formula; explain each term.

C · Explain

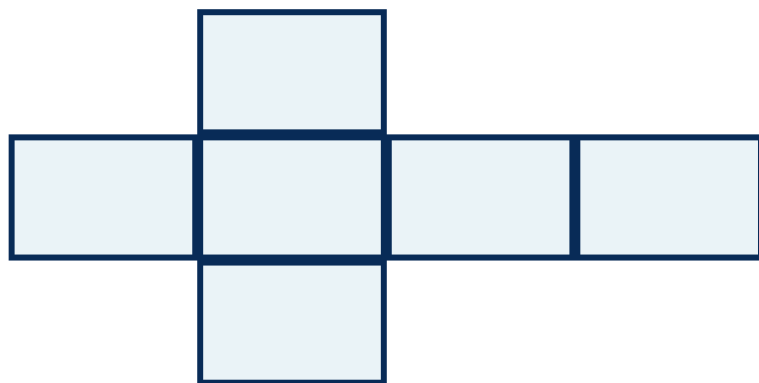
Start by stating which faces count and why.

Compare your route with a partner: what evidence would prove the objective?

Model 1: count exposed faces

Present

Cuboid net: every exposed face counts once



8 cm

5 cm

3 cm

Surface area uses square units; volume uses cubic units.

Cuboid $8 \times 5 \times 3$

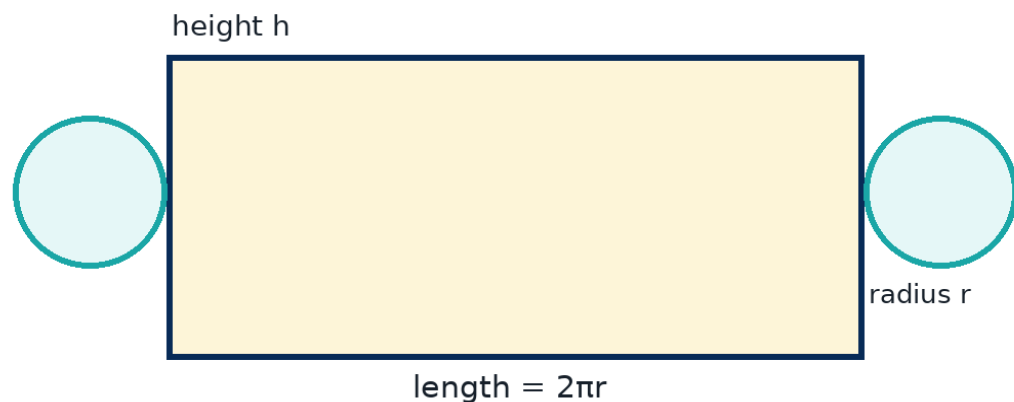
- Surface area = $2(lw + lh + wh)$
- = $2(40 + 24 + 15)$
- = 158 cm^2
- Volume = $lwh = 120 \text{ cm}^3$

Check: square units for faces; cubic units for space.

Model 2: unwrap a cylinder

Present

Cylinder surface area = rectangle + two circles



Total surface area = $2\pi r^2 + 2\pi rh$

Closed cylinder

- two circles: $2\pi r^2$
- curved rectangle: $2\pi rh$
- TSA = $2\pi r^2 + 2\pi rh$
- Volume = $\pi r^2 h$

Radius 4 cm, height 9 cm → TSA = $104\pi \text{ cm}^2$; V = $144\pi \text{ cm}^3$.

Which method is correct?

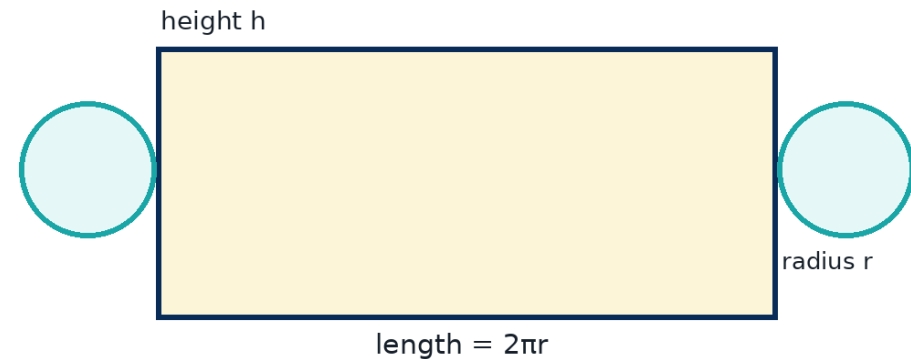
Present

A learner says a closed cylinder has surface area $2\pi rh$.

What have they forgotten?

- Identify the missing part.
- Explain why it must be included.
- Write the corrected formula.

Cylinder surface area = rectangle + two circles



Total surface area = $2\pi r^2 + 2\pi rh$

Answer: the two circular ends · $TSA = 2\pi r^2 + 2\pi rh$

Supported practice

Apply

A1 [NC]

A cuboid is $10 \text{ cm} \times 6 \text{ cm} \times 4 \text{ cm}$. Find its total surface area.

Scaffold: $2(lw + lh + wh)$

A2 [NC]

The same cuboid has volume 240 cm^3 . Explain why the units are cubic, not square.

When both are secure, remove the scaffold.

Independent practice: scaffold removed

Apply

A3 [C]

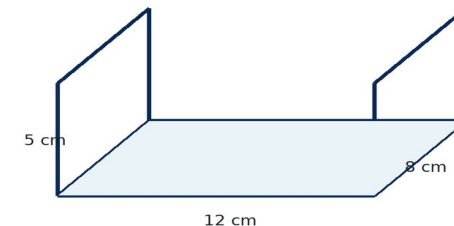
Closed cylinder: $r = 3.5 \text{ cm}$, $h = 12 \text{ cm}$. Find total surface area and volume to 1 d.p.

A4 [NC]

Open-top box: $12 \text{ cm} \times 8 \text{ cm} \times 5 \text{ cm}$. Find exposed surface area and capacity.

Show a separate check for each answer.

Open-top box: distinguish capacity from exposed area



No top face in surface area. Volume still uses base area $\times$ height.

Exam-style practice

Apply

E1 [C] · 4 marks

A closed cylinder has radius 5 cm and height 7 cm. A learner uses $2\pi rh$ for its surface area. Explain the error and calculate the correct total surface area in terms of π .

E2 [NC] · 5 marks

A cuboid has volume 360 cm^3 . Its base is 12 cm by 5 cm. Find its height, then find its total surface area.

Exam tip: write the structure/formula before substituting. Units are part of the mathematical communication.

Stretch and deep challenge

Apply

Stretch [NC]

A closed cuboid has volume 120 cm^3 and dimensions $4 \text{ cm} \times 5 \text{ cm} \times h$. Find h and its total surface area.

Deep challenge [C]

A cylinder has radius r and height $2r$. Express total surface area and volume in terms of r . What happens to each if r is doubled?

Do not rush to a decimal: reason algebraically.

Self-mark and repair

Apply

Use the teacher check to identify the first decision that went wrong.

- Was the solid open or closed?
- Did you count each required face once?
- Did you use radius rather than diameter?
- Did you keep square units for area and cubic units for volume?
- Did you round only at the end?

Repair one answer, then complete a fresh matched question without prompts.

Independent exit evidence

Without notes · 5 minutes

A closed cuboid measures $9\text{ cm} \times 4\text{ cm} \times 2\text{ cm}$.

- Find its total surface area.
- Find its volume.
- Use correct units.
- Show one check.

This is fresh evidence against the objective.

Distance travelled

Compare Connect & Check with your exit evidence.

WWW What is now more accurate, complete or clearly communicated?

EBI What one action will improve your next surface-area/volume problem?

Record your next practice target in the workbook.

Core answers

Teacher check

- C1 120 cm^3
- P1 surface area 158 cm^2 ; volume 120 cm^3
- P2 TSA $104\pi \text{ cm}^2$; V $144\pi \text{ cm}^3$
- A1 248 cm^2
- A3 $\approx 340.9 \text{ cm}^2$; $\approx 461.8 \text{ cm}^3$
- A4 296 cm^2 ; 480 cm^3
- E1 $120\pi \text{ cm}^2$; two circular ends were omitted
- E2 $h = 6 \text{ cm}$; surface area = 324 cm^2
- Stretch: $h = 6 \text{ cm}$; SA = 148 cm^2
- Deep challenge: SA = $6\pi r^2$; V = $2\pi r^3$; doubling $r \times 4$ area and $\times 8$ volume
- Exit: 124 cm^2 ; 72 cm^3

Before the next lesson

Recall & Review

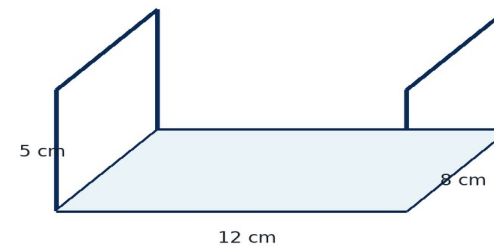
Next: plans, elevations and measures

Preparation

Sketch the front, side and plan views of four unit cubes arranged as a 2×2 square on the base.

Bring one question from today's lesson that you still want to test.

Open-top box: distinguish capacity from exposed area



No top face in surface area. Volume still uses base area $\times$ height.



L036 teacher notes

- Baseline misconception: cm^2 vs cm^3 / omitted faces.
- Route choice changes the journey, not the evidence.
- Remove scaffolds before A3.
- Keep exact π until final rounding.
- Exit evidence should be fresh and independent.

Next lesson: L037 Plans, elevations and measures

L036 Recall & Review

Surface area and volume



Fresh evidence: prove the objective

Solve a new question without prompts. Explain one check, then correct one error in your working.

Objective: Find surface area and volume using appropriate nets and formulae.

Write the next practice step before you leave. It must test the method again, not simply copy today's example.

Feedback language

Use the full phrases before the abbreviations.

What Went Well (WWW)

I selected the correct geometric fact, theorem, formula or transformation and used a clear diagram with appropriate labels and units.

Identify the mathematical method, representation, reasoning or check that improved.

Even Better If (EBI)

I will name the fact or theorem, show the substitution or construction step and check whether the size, direction and units of the result are reasonable.

Set one precise next-step action and test it on a fresh question.

Extension route

Choose this route only after the core evidence is secure.

Stretch

A closed cuboid has volume 120 cm^3 and dimensions 4 cm by 5 cm by h . Find h and surface area.

Deep challenge

A cylinder has radius r and height $2r$. Express its total surface area and volume in terms of r .

Explain your reasoning clearly enough that another learner could check it.