GCSE MATHEMATICS

FOUNDATION TIER
COMPREHENSIVE LESSON NOTEBOOK

UNIT 7 | MENSURATION

TEACH-FROM-SCRATCH • PUBLICATION EDITION

10 detailed chapters • original diagrams • worked examples • guided practice • answers

COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Practice third.

FIVE-PASS ROUTINE

1 Read the key idea without a calculator. 2 Cover each worked solution and reproduce it. 3 Complete practice independently. 4 Mark in a different colour and repair errors. 5 Retest after 2–7 days.

What a complete mathematics answer contains

- A clear model or calculation, not only a calculator display.
- Enough working for another person to follow the reasoning.
- Exact values until approximation is requested.
- Units and sensible rounding in context.
- A final statement when interpretation is required.

Error loop

REPAIR, DO NOT MERELY CORRECT

Label each error: concept, operation, arithmetic, calculator entry, accuracy, unit or interpretation. Write the corrected step and one sentence explaining the change.

Foundation does not mean superficial

OCR Foundation questions can combine familiar skills in unfamiliar contexts. Grade 4–5 success depends on selecting a method, connecting several steps and deciding whether the answer is reasonable.

COMPREHENSIVE LESSON NOTEBOOK

Unit 7 coverage map

OCR J560 Mensuration content organised into a teachable sequence.

CH 01	OCR 10.01a	Units and measurement
CH 02	OCR 10.01b-10.01c	Compound units, maps and scales
CH 03	OCR 10.02a-10.02c	Perimeter and compound boundaries
CH 04	OCR 10.03a-10.03c; 10.03e	Area of polygons and compound shapes
CH 05	OCR 10.02b; 10.03d	Circles, arcs and sectors
CH 06	OCR 10.04a	Prisms and volume
CH 07	OCR 10.04a	Surface area and nets
CH 08	OCR 10.04b-10.04c	Cones, spheres and pyramids
CH 09	OCR 10.05a	Pythagoras' theorem
CH 10	OCR 10.05b-10.05c; 10.01-10.05 syn	Trigonometry and exact values

IMPORTANT TIER NOTE

This notebook covers OCR J560 section 10 at Foundation Tier: measurement, scale, perimeter, area, circles, solids, Pythagoras and right-angle trigonometry. Specification references are identifiers, not copied specification wording.

COMPREHENSIVE LESSON NOTEBOOK

Fast-reference method bank

Understand each relationship before memorising it.

Speed / density	speed=d÷t; density=m÷V
Map scale 1:n	real length=drawing length×n
Polygon areas	rectangle=lw; triangle=½ bh; trapezium=½(a+b)h
Circle	C=2πr; A=πr²
Prism volume	cross-sectional area×length
Sphere	V=4/3πr³; A=4πr²
Cone	V=1/3πr²h; curved area=πrl
Pyramid volume	1/3×base area×perpendicular height
Pythagoras	$a^2+b^2=c^2$
Right triangle	sin=O/H; cos=A/H; tan=O/A

CURRENT ASSESSMENT NOTE

OCR has announced Foundation and Higher formula sheets for GCSE Mathematics examinations in 2025, 2026 and 2027. Use the current official OCR sheet alongside this learning bank and check OCR for later exam-series arrangements.

COMPREHENSIVE LESSON NOTEBOOK

Units and measurement

Convert length, area, volume, capacity, mass and time units.

SPECIFICATION FOCUS

OCR reference OCR 10.01a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Units describe what is measured. Linear, square and cubic measures scale differently, so conversion factors must match dimension.

KEY VOCABULARY

metric unit • length • area • volume • capacity • precision

1 m = 100 cm • **1 m² = 10,000 cm²**

linear factor 100 • area factor 100²

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Convert 3.7 m to centimetres. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Units and measurement — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Write the conversion factor.
- For area square the length factor; for volume cube it.
- Convert before substituting into a formula.

WORKED EXAMPLE 1

Convert 3.7 m to centimetres.

SOLUTION

1. 1 m=100 cm, so 3.7×100=370.

ANSWER: 370 cm

WORKED EXAMPLE 2

Convert 4500 mm to metres.

SOLUTION

1. 1000 mm=1 m.
2. 4500÷1000=4.5.

ANSWER: 4.5 m

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Units and measurement — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Construction, science and everyday measurement require reliable conversions.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Convert 2.4 m² to cm². First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why 1 m² is 10,000 cm², not 100 cm². Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Units and measurement

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Convert 3.7 m to centimetres.** **[1]**

2. **Convert 4500 mm to metres.** **[2]**

3. **Convert 2.4 m² to cm².** **[2]**

4. **Convert 0.035 m³ to litres.** **[2]**

5. **Convert 2.75 kg to grams.** **[1]**

6. **Convert 2 h 45 min to minutes.** **[2]**

7. **A length is 8.4 cm to nearest mm. State it in mm.** **[1]**

8. **Explain why 1 m² is 10,000 cm², not 100 cm².** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Compound units, maps and scales

Use rates and scale factors with consistent units.

SPECIFICATION FOCUS

OCR reference OCR 10.01b-10.01c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Compound units compare quantities. A scale drawing uses one constant linear ratio, while rates arise from division with meaningful units.

KEY VOCABULARY

speed • density • flow rate • scale drawing • map ratio

$$\frac{\text{drawing}}{\text{real} = \text{drawing} \times \text{scale}}$$

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Travel 150 km in 3 h. Find speed. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Compound units, maps and scales — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use speed=distance/time and density=mass/volume.
- Convert units before dividing.
- For scale 1:n, multiply drawing length by n.

WORKED EXAMPLE 1

Travel 150 km in 3 h. Find speed.

SOLUTION

1. 150÷3=50.

ANSWER: 50 km/h

WORKED EXAMPLE 2

A block mass 540 g, volume 60 cm³. Find density.

SOLUTION

1. Density=540÷60.

ANSWER: 9 g/cm³

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Compound units, maps and scales — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Travel, materials and maps depend on rates and scale.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

A map scale is 1:50,000. What does 4 cm represent? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why map units must match before using the scale. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Compound units, maps and scales

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Travel 150 km in 3 h. Find speed.** **[2]**

2. **A block mass 540 g, volume 60 cm³. Find density.** **[2]**

3. **A map scale is 1:50,000. What does 4 cm represent?** **[3]**

4. **A car travels 72 km/h for 25 min. Find distance.** **[3]**

5. **Flow rate is 18 L/min for 7.5 min. Find volume.** **[2]**

6. **A real wall 12 m is 8 cm on a plan. Find scale.** **[3]**

7. **A runner covers 400 m in 50 s. Find m/s.** **[2]**

8. **Explain why map units must match before using the scale.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Perimeter and compound boundaries

Find rectilinear, circular and composite boundary lengths without counting internal edges.

SPECIFICATION FOCUS

OCR reference OCR 10.02a-10.02c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Perimeter is total distance around the outside. Internal edges are excluded and curved boundaries require circumference or arc length.

KEY VOCABULARY

perimeter • boundary • exposed edge • regular • semicircle

trace the outside boundary once

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Find perimeter of rectangle 8 cm by 5 cm. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Perimeter and compound boundaries — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Trace the outside boundary once.
- Find missing lengths from aligned totals.
- Add only exposed edges and include units.

WORKED EXAMPLE 1

Find perimeter of rectangle 8 cm by 5 cm.

SOLUTION

1. $2(8+5)=26$.

ANSWER: 26 cm

WORKED EXAMPLE 2

A square has perimeter 36 cm. Find side.

SOLUTION

1. $36\div4=9$.

ANSWER: 9 cm

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Perimeter and compound boundaries — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Fencing, edging and frames are perimeter applications.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Triangle sides are 7.2,8.5,10.1 cm. Find perimeter. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State one reliable check for a compound perimeter. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Perimeter and compound boundaries

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Find perimeter of rectangle 8 cm by 5 cm.** **[2]**

2. **A square has perimeter 36 cm. Find side.** **[2]**

3. **Triangle sides are 7.2,8.5,10.1 cm. Find perimeter.** **[2]**

4. **An L-shape comes from 10×8 rectangle with 4×3 corner removed. Find perimeter.** **[3]**

5. **A regular hexagon side is 6.5 cm. Find perimeter.** **[2]**

6. **A semicircle has diameter 10 cm. Find total perimeter to 1 d.p.** **[3]**

7. **A rectangle perimeter 42 cm and length 13 cm. Find width.** **[3]**

8. **State one reliable check for a compound perimeter.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Area of polygons and compound shapes

Calculate triangle, parallelogram, trapezium and composite areas.

SPECIFICATION FOCUS

OCR reference OCR 10.03a-10.03c; 10.03e. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Area measures enclosed surface. Compound regions can be partitioned or found by subtraction without overlaps or gaps.

KEY VOCABULARY

area • perpendicular height • compound shape • cut-out • tessellation

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Find rectangle area 12 cm by 7 cm. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Area of polygons and compound shapes — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Choose the formula that matches the perpendicular dimensions.
- Split compound shapes into non-overlapping parts.
- Subtract cut-outs only after finding both areas.

WORKED EXAMPLE 1

Find rectangle area 12 cm by 7 cm.

SOLUTION

1. $12\times7=84$.

ANSWER: 84 cm²

WORKED EXAMPLE 2

Find triangle area base 9 cm, perpendicular height 6 cm.

SOLUTION

1. $1/2\times9\times6=27$.

ANSWER: 27 cm²

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Area of polygons and compound shapes — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Flooring, painting and land measurement use area.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Find parallelogram area base 11 cm, height 4.5 cm. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Why must the triangle height be perpendicular to the base? Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Area of polygons and compound shapes

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Find rectangle area 12 cm by 7 cm.** [1]

2. **Find triangle area base 9 cm, perpendicular height 6 cm.** [2]

3. **Find parallelogram area base 11 cm, height 4.5 cm.** [2]

4. **Find trapezium area with parallel sides 8 and 14 cm, height 5 cm.** [3]

5. **A 10×8 rectangle has 3×2 cut-out. Find remaining area.** [2]

6. **A triangle area is 48 cm² and base 12 cm. Find height.** [3]

7. **A floor 6 m by 4.5 m uses tiles covering 0.25 m². Find tiles.** [3]

8. **Why must the triangle height be perpendicular to the base?** [2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Circles, arcs and sectors

Use radius, diameter and fractions of a full circle.

SPECIFICATION FOCUS

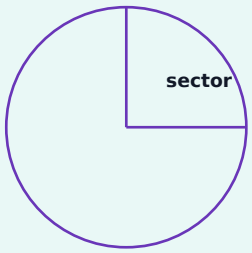
OCR reference OCR 10.02b; 10.03d. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Circle measures are built from radius and π. Sectors are fractions of a full 360° circle; perimeter and area require different boundaries.

KEY VOCABULARY

radius • diameter • circumference • sector • arc



Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Find circumference for radius 6 cm, to 1 d.p. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Circles, arcs and sectors — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use $C=2\pi r=\pi d$ and $A=\pi r^2$.
- For sectors and arcs multiply by angle/360.
- Keep π until the final rounding step.

WORKED EXAMPLE 1

Find circumference for radius 6 cm, to 1 d.p.

SOLUTION

1. $C=2\pi\times6=12\pi=37.699...$

ANSWER: 37.7 cm

WORKED EXAMPLE 2

Find area for diameter 10 cm, to 1 d.p.

SOLUTION

1. Radius=5 cm.
2. $A=\pi\times25=78.539...$

ANSWER: 78.5 cm²

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Circles, arcs and sectors — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Wheels, dials and circular design use circle measures.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Find arc length of a 90° sector radius 8 cm. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why a sector perimeter needs two radii. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Circles, arcs and sectors

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Find circumference for radius 6 cm, to 1 d.p.** **[2]**

2. **Find area for diameter 10 cm, to 1 d.p.** **[3]**

3. **Find arc length of a 90° sector radius 8 cm.** **[3]**

4. **Find area of a 60° sector radius 9 cm.** **[3]**

5. **A circle circumference is 14π cm. Find radius.** **[2]**

6. **Find perimeter of a semicircle radius 4 cm.** **[3]**

7. **A wheel diameter 0.7 m turns 100 times. Find distance to nearest metre.** **[3]**

8. **Explain why a sector perimeter needs two radii.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Prisms and volume

Find volume from cross-sectional area and length.

SPECIFICATION FOCUS

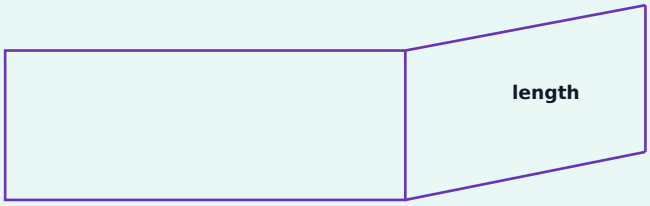
OCR reference OCR 10.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A prism repeats a constant cross-section through a length. Multiplying the layer area by length counts three-dimensional space.

KEY VOCABULARY

prism • cross-section • length • volume • capacity



Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Find volume of cuboid 8×5×3 cm. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Prisms and volume — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use volume=cross-sectional area×length.
- For cuboids use lwh.
- Make all dimensions use compatible units.

WORKED EXAMPLE 1

Find volume of cuboid 8×5×3 cm.

SOLUTION

1. 8×5×3=120.

ANSWER: 120 cm³

WORKED EXAMPLE 2

A prism cross-section area 24 cm², length 10 cm. Find volume.

SOLUTION

1. 24×10=240.

ANSWER: 240 cm³

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Prisms and volume — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Packaging, tanks and building components use prism volumes.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Triangular prism triangle base 6, height 4, length 9 cm. Find volume. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why prism volume uses cross-section area, not perimeter. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Prisms and volume

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Find volume of cuboid 8×5×3 cm.** **[2]**

2. **A prism cross-section area 24 cm², length 10 cm. Find volume.** **[2]**

3. **Triangular prism triangle base 6, height 4, length 9 cm. Find volume.** **[3]**

4. **A cuboid volume 360 cm³, base 12×5 cm. Find height.** **[3]**

5. **A tank 1.2×0.5×0.8 m. Find capacity in litres.** **[3]**

6. **A prism volume 525 cm³ and length 15 cm. Find cross-section area.** **[2]**

7. **A cube has side 4.5 cm. Find volume.** **[2]**

8. **Explain why prism volume uses cross-section area, not perimeter.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Surface area and nets

Add the areas of every exposed face.

SPECIFICATION FOCUS

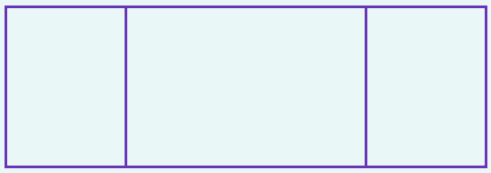
OCR reference OCR 10.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Surface area totals every exposed face. A net makes those faces visible and helps prevent omissions or double counting.

KEY VOCABULARY

surface area • face • net • exposed • square unit



net: add every exposed face

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Find surface area of cube side 5 cm. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Surface area and nets — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Sketch or inspect a net.
- Group congruent faces.
- Exclude joined internal faces.

WORKED EXAMPLE 1

Find surface area of cube side 5 cm.

SOLUTION

1. Six faces each area 25.
2. 6×25=150.

ANSWER: 150 cm²

WORKED EXAMPLE 2

Find surface area cuboid 8×4×3 cm.

SOLUTION

1. 2(8×4+8×3+4×3).
2. 2(32+24+12)=136.

ANSWER: 136 cm²

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Surface area and nets — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Wrapping, coating and material estimates use surface area.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

A closed triangular prism has triangle sides 3,4,5, length 10. Find surface area. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State a check for surface area units. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Surface area and nets

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Find surface area of cube side 5 cm.** **[2]**

2. **Find surface area cuboid 8×4×3 cm.** **[3]**

3. **A closed triangular prism has triangle sides 3,4,5, length 10. Find surface area.** **[4]**

4. **A cube surface area is 216 cm². Find side.** **[3]**

5. **An open-top 10×6×4 cm box. Find surface area.** **[3]**

6. **How many rectangles appear in a triangular-prism net?** **[1]**

7. **Why may two nets fold to the same solid?** **[2]**

8. **State a check for surface area units.** **[1]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Cones, spheres and pyramids

Use supplied solid formulae and distinguish perpendicular from slant height.

SPECIFICATION FOCUS

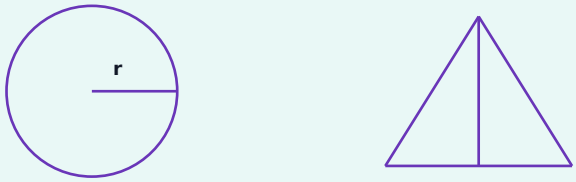
OCR reference OCR 10.04b-10.04c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Curved solids and pyramids use supplied formulae. Perpendicular height measures direct separation; slant height lies on a surface.

KEY VOCABULARY

sphere • cone • pyramid • perpendicular height • slant height



sphere radius • pyramid perpendicular height

Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: A sphere has radius 3 cm. Use $V=4/3\pi r^3$ to find its volume in terms of π. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Cones, spheres and pyramids — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Copy the supplied formula before substituting.
- Use perpendicular height for volume; use slant height only where a surface-area formula requires it.
- Keep pi until the final rounding step.

WORKED EXAMPLE 1

A sphere has radius 3 cm. Use $V=4/3\pi r^3$ to find its volume in terms of π.

SOLUTION

1. $V=4/3\pi\times3^3$.
2. $V=36\pi$ cm³.

ANSWER: 36π cm³

WORKED EXAMPLE 2

A cone has radius 4 cm and perpendicular height 9 cm. Use $V=1/3\pi r^2h$.

SOLUTION

1. $V=1/3\pi\times16\times9$.
2. $V=48\pi$ cm³.

ANSWER: 48π cm³

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Cones, spheres and pyramids — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Packaging, storage and engineering use volumes and surface areas of solids.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

A pyramid has base area 30 cm² and perpendicular height 8 cm. Find its volume. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two checks for a curved-solid calculation. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Cones, spheres and pyramids

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A sphere has radius 3 cm. Use $V=4/3\pi r^3$ to find its volume in terms of π.** [3]

2. **A cone has radius 4 cm and perpendicular height 9 cm. Use $V=1/3\pi r^2h$.** [3]

3. **A pyramid has base area 30 cm² and perpendicular height 8 cm. Find its volume.** [3]

4. **A sphere has radius 5 cm. Use $A=4\pi r^2$ to find surface area in terms of π.** [3]

5. **A cone has radius 3 cm and slant height 7 cm. Use curved area=πrl.** [2]

6. **Why is the cone height in its volume formula perpendicular?** [2]

7. **A pyramid volume is 120 cm³ and its base area is 45 cm². Find its perpendicular height.** [3]

8. **State two checks for a curved-solid calculation.** [2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Pythagoras' theorem

Find missing sides in right-angled triangles.

SPECIFICATION FOCUS

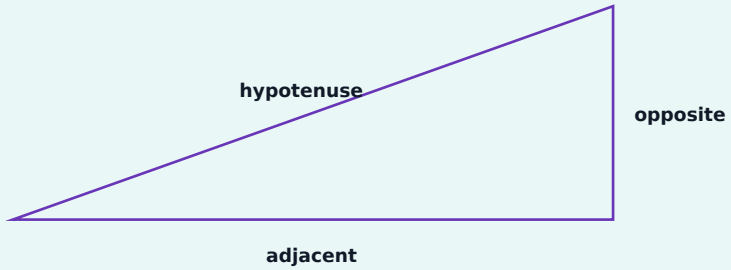
OCR reference OCR 10.05a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Pythagoras links the three sides of a right triangle. The hypotenuse lies opposite 90° and its square equals the sum of the other two squares.

KEY VOCABULARY

right angle • hypotenuse • square • theorem • diagonal



Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: Legs are 6 and 8 cm. Find hypotenuse. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Pythagoras' theorem — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Identify the hypotenuse opposite the right angle.
- Use $a^2+b^2=c^2$.
- Subtract for a shorter side and reject negative lengths.

WORKED EXAMPLE 1

Legs are 6 and 8 cm. Find hypotenuse.

SOLUTION

1. $c^2=36+64=100$.
2. $c=10$.

ANSWER: 10 cm

WORKED EXAMPLE 2

Hypotenuse 13 cm, one leg 5 cm. Find other leg.

SOLUTION

1. $b^2=169-25=144$.
2. $b=12$.

ANSWER: 12 cm

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Pythagoras' theorem — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Diagonals, ladders and shortest straight distances use Pythagoras.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

Rectangle 9 by 12 cm. Find diagonal. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State a check before using Pythagoras. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Pythagoras' theorem

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Legs are 6 and 8 cm. Find hypotenuse.** **[3]**

2. **Hypotenuse 13 cm, one leg 5 cm. Find other leg.** **[3]**

3. **Rectangle 9 by 12 cm. Find diagonal.** **[3]**

4. **Is a triangle with sides 7,24,25 right-angled?** **[3]**

5. **Find hypotenuse with legs 4 and 7, to 1 d.p.** **[3]**

6. **A ladder 10 m reaches 8 m high. Find foot distance.** **[3]**

7. **Why is the hypotenuse always the longest side?** **[2]**

8. **State a check before using Pythagoras.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Trigonometry and exact values

Use sine, cosine and tangent, including required exact values, in Foundation contexts.

SPECIFICATION FOCUS

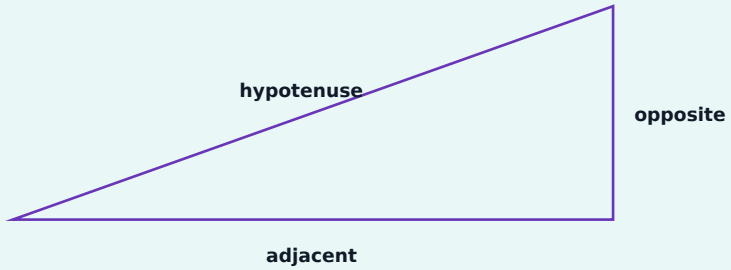
OCR reference OCR 10.05b-10.05c; 10.01-10.05 synthesis. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Trigonometric ratios link an acute angle to side ratios in a right triangle. Required exact values should remain exact rather than decimalised.

KEY VOCABULARY

opposite • adjacent • hypotenuse • sine • cosine • tangent



Why the method works

- The formula follows from the geometric structure or defining rate.
- Units track the type and scale of the result.
- An estimate or inverse calculation provides an independent check.

CHECK BEFORE MOVING ON

Answer mentally: In a right triangle, opposite=6, hypotenuse=10. Find sin θ. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Trigonometry and exact values — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Label opposite, adjacent and hypotenuse relative to the angle.
- Choose SOH, CAH or TOA.
- Use inverse trig for angles and check units/rounding.

WORKED EXAMPLE 1

In a right triangle, opposite=6, hypotenuse=10. Find sin θ.

SOLUTION

1. sin θ=opposite/hypotenuse=6/10.

ANSWER: 0.6

WORKED EXAMPLE 2

Adjacent=8, hypotenuse=10. Find θ to 1 d.p.

SOLUTION

1. cos θ=8/10=0.8.
2. θ=$\cos^{-1}$(0.8)=36.87…°.

ANSWER: 36.9°

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Trigonometry and exact values — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Heights, slopes and surveying use right-angle trigonometry.

Common misconceptions

- Using incompatible units.
- Selecting a visually familiar but incorrect formula.
- Rounding before the final step or omitting units.

GUIDED TRY

θ=30°, hypotenuse=12. Find opposite. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two checks for a mensuration answer. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Trigonometry and exact values

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **In a right triangle, opposite=6, hypotenuse=10. Find sin θ.** **[2]**

2. **Adjacent=8, hypotenuse=10. Find θ to 1 d.p.** **[3]**

3. **θ=30°, hypotenuse=12. Find opposite.** **[3]**

4. **θ=40°, adjacent=7. Find opposite to 1 d.p.** **[3]**

5. **A ramp rises 1.2 m over horizontal 5 m. Find angle to 1 d.p.** **[3]**

6. **State the exact values of sin 30° and cos 60°.** **[2]**

7. **State the exact values of sin 45° and tan 45°.** **[2]**

8. **State two checks for a mensuration answer.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Units and measurement

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Convert 3.7 m to centimetres.

ANSWER: 370 cm

Method cue: 1 m=100 cm, so 3.7×100=370. Check sign, size, accuracy and units.

2. Convert 4500 mm to metres.

ANSWER: 4.5 m

Method cue: 1000 mm=1 m. Check sign, size, accuracy and units.

3. Convert 2.4 m² to cm².

ANSWER: 24,000 cm²

Method cue: 1 m²=10,000 cm². Check sign, size, accuracy and units.

4. Convert 0.035 m³ to litres.

ANSWER: 35 litres

Method cue: 1 m³=1000 L. Check sign, size, accuracy and units.

5. Convert 2.75 kg to grams.

ANSWER: 2750 g

Method cue: Multiply by 1000. Check sign, size, accuracy and units.

6. Convert 2 h 45 min to minutes.

ANSWER: 165 minutes

Method cue: 2 h=120 min. Check sign, size, accuracy and units.

7. A length is 8.4 cm to nearest mm. State it in mm.

ANSWER: 84 mm

Method cue: Multiply centimetres by 10. Check sign, size, accuracy and units.

8. Explain why 1 m² is 10,000 cm², not 100 cm².

ANSWER: Both dimensions scale by 100.

Method cue: Area factor=100². Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Compound units, maps and scales

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Travel 150 km in 3 h. Find speed.

ANSWER: 50 km/h

Method cue: 150÷3=50. Check sign, size, accuracy and units.

2. A block mass 540 g, volume 60 cm³. Find density.

ANSWER: 9 g/cm³

Method cue: Density=540÷60. Check sign, size, accuracy and units.

3. A map scale is 1:50,000. What does 4 cm represent?

ANSWER: 2 km

Method cue: Real=4×50,000=200,000 cm. Check sign, size, accuracy and units.

4. A car travels 72 km/h for 25 min. Find distance.

ANSWER: 30 km

Method cue: 25 min=25/60 h. Check sign, size, accuracy and units.

5. Flow rate is 18 L/min for 7.5 min. Find volume.

ANSWER: 135 L

Method cue: 18×7.5=135. Check sign, size, accuracy and units.

6. A real wall 12 m is 8 cm on a plan. Find scale.

ANSWER: 1:150

Method cue: 12 m=1200 cm. Check sign, size, accuracy and units.

7. A runner covers 400 m in 50 s. Find m/s.

ANSWER: 8 m/s

Method cue: 400÷50=8. Check sign, size, accuracy and units.

8. Explain why map units must match before using the scale.

ANSWER: The ratio compares like units.

Method cue: Convert both lengths to one unit. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Perimeter and compound boundaries

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Find perimeter of rectangle 8 cm by 5 cm.

ANSWER: 26 cm

Method cue: 2(8+5)=26. Check sign, size, accuracy and units.

2. A square has perimeter 36 cm. Find side.

ANSWER: 9 cm

Method cue: 36÷4=9. Check sign, size, accuracy and units.

3. Triangle sides are 7.2,8.5,10.1 cm. Find perimeter.

ANSWER: 25.8 cm

Method cue: Add all three sides. Check sign, size, accuracy and units.

4. An L-shape comes from 10×8 rectangle with 4×3 corner removed. Find perimeter.

ANSWER: 36 cm

Method cue: Corner removal replaces equal horizontal and vertical lengths. Check sign, size, accuracy and units.

5. A regular hexagon side is 6.5 cm. Find perimeter.

ANSWER: 39 cm

Method cue: 6×6.5=39. Check sign, size, accuracy and units.

6. A semicircle has diameter 10 cm. Find total perimeter to 1 d.p.

ANSWER: 25.7 cm

Method cue: Half circumference=5π. Check sign, size, accuracy and units.

7. A rectangle perimeter 42 cm and length 13 cm. Find width.

ANSWER: 8 cm

Method cue: 2(13+w)=42. Check sign, size, accuracy and units.

8. State one reliable check for a compound perimeter.

ANSWER: Trace each exposed edge exactly once and compare horizontal/vertical totals.

Method cue: Internal edges must not be included. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Area of polygons and compound shapes

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Find rectangle area 12 cm by 7 cm.

ANSWER: 84 cm²

Method cue: 12×7=84. Check sign, size, accuracy and units.

2. Find triangle area base 9 cm, perpendicular height 6 cm.

ANSWER: 27 cm²

Method cue: 1/2×9×6=27. Check sign, size, accuracy and units.

3. Find parallelogram area base 11 cm, height 4.5 cm.

ANSWER: 49.5 cm²

Method cue: 11×4.5=49.5. Check sign, size, accuracy and units.

4. Find trapezium area with parallel sides 8 and 14 cm, height 5 cm.

ANSWER: 55 cm²

Method cue: 1/2(8+14)×5=55. Check sign, size, accuracy and units.

5. A 10×8 rectangle has 3×2 cut-out. Find remaining area.

ANSWER: 74 cm²

Method cue: 80-6=74. Check sign, size, accuracy and units.

6. A triangle area is 48 cm² and base 12 cm. Find height.

ANSWER: 8 cm

Method cue: 48=1/2×12×h=6h. Check sign, size, accuracy and units.

7. A floor 6 m by 4.5 m uses tiles covering 0.25 m². Find tiles.

ANSWER: 108 tiles

Method cue: Area=27 m². Check sign, size, accuracy and units.

8. Why must the triangle height be perpendicular to the base?

ANSWER: The area formula uses perpendicular separation.

Method cue: A sloping side is not the required height. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Circles, arcs and sectors

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Find circumference for radius 6 cm, to 1 d.p.

ANSWER: 37.7 cm

Method cue: C=2π×6=12π=37.699... Check sign, size, accuracy and units.

2. Find area for diameter 10 cm, to 1 d.p.

ANSWER: 78.5 cm²

Method cue: Radius=5 cm. Check sign, size, accuracy and units.

3. Find arc length of a 90° sector radius 8 cm.

ANSWER: 4π cm ≈ 12.6 cm

Method cue: 90/360×2π×8=4π. Check sign, size, accuracy and units.

4. Find area of a 60° sector radius 9 cm.

ANSWER: 13.5π cm² ≈ 42.4 cm²

Method cue: 60/360×π×9²=13.5π. Check sign, size, accuracy and units.

5. A circle circumference is 14π cm. Find radius.

ANSWER: 7 cm

Method cue: 2πr=14π, so r=7. Check sign, size, accuracy and units.

6. Find perimeter of a semicircle radius 4 cm.

ANSWER: 8 + 4π cm ≈ 20.6 cm

Method cue: Half circumference=4π. Check sign, size, accuracy and units.

7. A wheel diameter 0.7 m turns 100 times. Find distance to nearest metre.

ANSWER: 220 m

Method cue: One turn=0.7π m. Check sign, size, accuracy and units.

8. Explain why a sector perimeter needs two radii.

ANSWER: Its boundary contains the arc and both straight radial edges.

Method cue: Area needs only the fraction of πr², but perimeter includes edges. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Prisms and volume

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Find volume of cuboid 8×5×3 cm.

ANSWER: 120 cm³

Method cue: 8×5×3=120. Check sign, size, accuracy and units.

2. A prism cross-section area 24 cm², length 10 cm. Find volume.

ANSWER: 240 cm³

Method cue: 24×10=240. Check sign, size, accuracy and units.

3. Triangular prism triangle base 6, height 4, length 9 cm. Find volume.

ANSWER: 108 cm³

Method cue: Triangle area=12 cm². Check sign, size, accuracy and units.

4. A cuboid volume 360 cm³, base 12×5 cm. Find height.

ANSWER: 6 cm

Method cue: Base area=60. Check sign, size, accuracy and units.

5. A tank 1.2×0.5×0.8 m. Find capacity in litres.

ANSWER: 480 litres

Method cue: Volume=0.48 m³. Check sign, size, accuracy and units.

6. A prism volume 525 cm³ and length 15 cm. Find cross-section area.

ANSWER: 35 cm²

Method cue: 525÷15=35. Check sign, size, accuracy and units.

7. A cube has side 4.5 cm. Find volume.

ANSWER: 91.125 cm³

Method cue: 4.5³=91.125. Check sign, size, accuracy and units.

8. Explain why prism volume uses cross-section area, not perimeter.

ANSWER: Area measures each layer of space.

Method cue: Repeating the layer through a length creates volume. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Surface area and nets

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Find surface area of cube side 5 cm.

ANSWER: 150 cm²

Method cue: Six faces each area 25. Check sign, size, accuracy and units.

2. Find surface area cuboid 8×4×3 cm.

ANSWER: 136 cm²

Method cue: 2(8×4+8×3+4×3). Check sign, size, accuracy and units.

3. A closed triangular prism has triangle sides 3,4,5, length 10. Find surface area.

ANSWER: 132 cm²

Method cue: Two triangles: 2×6=12. Check sign, size, accuracy and units.

4. A cube surface area is 216 cm². Find side.

ANSWER: 6 cm

Method cue: One face=216÷6=36 cm². Check sign, size, accuracy and units.

5. An open-top 10×6×4 cm box. Find surface area.

ANSWER: 188 cm²

Method cue: Base=60. Check sign, size, accuracy and units.

6. How many rectangles appear in a triangular-prism net?

ANSWER: 3

Method cue: One for each side of the triangular cross-section. Check sign, size, accuracy and units.

7. Why may two nets fold to the same solid?

ANSWER: Faces can be hinged in different arrangements while preserving adjacency.

Method cue: Folding joins the same corresponding edges. Check sign, size, accuracy and units.

8. State a check for surface area units.

ANSWER: Use square units

Method cue: Surface area measures 2D faces. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Cones, spheres and pyramids

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A sphere has radius 3 cm. Use $V=4/3\pi r^3$ to find its volume in terms of π.

ANSWER: 36π cm³

Method cue: $V=4/3\pi\times3^3$. Check sign, size, accuracy and units.

2. A cone has radius 4 cm and perpendicular height 9 cm. Use $V=1/3\pi r^2h$.

ANSWER: 48π cm³

Method cue: $V=1/3\pi\times16\times9$. Check sign, size, accuracy and units.

3. A pyramid has base area 30 cm² and perpendicular height 8 cm. Find its volume.

ANSWER: 80 cm³

Method cue: V=1/3×base area×height. Check sign, size, accuracy and units.

4. A sphere has radius 5 cm. Use $A=4\pi r^2$ to find surface area in terms of π.

ANSWER: 100π cm²

Method cue: $A=4\pi\times25$. Check sign, size, accuracy and units.

5. A cone has radius 3 cm and slant height 7 cm. Use curved area=πrl.

ANSWER: 21π cm²

Method cue: $\pi\times3\times7=21\pi$. Check sign, size, accuracy and units.

6. Why is the cone height in its volume formula perpendicular?

ANSWER: Volume depends on the shortest distance from base to vertex.

Method cue: A slant length is not the layer separation. Check sign, size, accuracy and units.

7. A pyramid volume is 120 cm³ and its base area is 45 cm². Find its perpendicular height.

ANSWER: 8 cm

Method cue: $120=1/3\times45\times h=15h$. Check sign, size, accuracy and units.

8. State two checks for a curved-solid calculation.

ANSWER: Use the stated radius and height correctly and give square or cubic units.

Method cue: Check whether an exact or rounded answer is required. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Pythagoras' theorem

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Legs are 6 and 8 cm. Find hypotenuse.

ANSWER: 10 cm

Method cue: $c^2=36+64=100$. Check sign, size, accuracy and units.

2. Hypotenuse 13 cm, one leg 5 cm. Find other leg.

ANSWER: 12 cm

Method cue: $b^2=169-25=144$. Check sign, size, accuracy and units.

3. Rectangle 9 by 12 cm. Find diagonal.

ANSWER: 15 cm

Method cue: $d^2=81+144=225$. Check sign, size, accuracy and units.

4. Is a triangle with sides 7,24,25 right-angled?

ANSWER: Yes

Method cue: $7^2+24^2=49+576=625=25^2$. Check sign, size, accuracy and units.

5. Find hypotenuse with legs 4 and 7, to 1 d.p.

ANSWER: 8.1

Method cue: $c=\sqrt{(16+49)}=\sqrt{65}=8.062...$ Check sign, size, accuracy and units.

6. A ladder 10 m reaches 8 m high. Find foot distance.

ANSWER: 6 m

Method cue: $x^2=10^2-8^2=36$. Check sign, size, accuracy and units.

7. Why is the hypotenuse always the longest side?

ANSWER: Its square equals the sum of two positive squares.

Method cue: Therefore c^2 exceeds either a^2 or b^2. Check sign, size, accuracy and units.

8. State a check before using Pythagoras.

ANSWER: The triangle must be right-angled and c must be the hypotenuse.

Method cue: Locate the 90° mark. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Trigonometry and exact values

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. In a right triangle, opposite=6, hypotenuse=10. Find sin θ.

ANSWER: 0.6

Method cue: sin θ=opposite/hypotenuse=6/10. Check sign, size, accuracy and units.

2. Adjacent=8, hypotenuse=10. Find θ to 1 d.p.

ANSWER: 36.9°

Method cue: cos θ=8/10=0.8. Check sign, size, accuracy and units.

3. θ=30°, hypotenuse=12. Find opposite.

ANSWER: 6

Method cue: sin30°=x/12. Check sign, size, accuracy and units.

4. θ=40°, adjacent=7. Find opposite to 1 d.p.

ANSWER: 5.9

Method cue: tan40°=x/7. Check sign, size, accuracy and units.

5. A ramp rises 1.2 m over horizontal 5 m. Find angle to 1 d.p.

ANSWER: 13.5°

Method cue: tan θ=1.2/5. Check sign, size, accuracy and units.

6. State the exact values of sin 30° and cos 60°.

ANSWER: 1/2 and 1/2

Method cue: Both exact values equal 1/2. Check sign, size, accuracy and units.

7. State the exact values of sin 45° and tan 45°.

ANSWER: √2/2 and 1

Method cue: Use the required exact-value set. Check sign, size, accuracy and units.

8. State two checks for a mensuration answer.

ANSWER: Correct formula/units and sensible magnitude or inverse check.

Method cue: Estimate first. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Independent authorship and release check

OCR Foundation Mathematics • Unit 7 Mensuration

ORIGINAL-CONTENT STATEMENT

This publication contains independently written teaching explanations, examples, practice questions, numerical data, diagrams and solutions. OCR is referenced solely to identify the J560 qualification. No OCR logo, official assessment question, mark scheme, examiner-report text or protected assessment layout is reproduced.

Release checklist

- 10 publisher-organised publisher-organised chapters mapped to OCR J560 section 10.
- Every chapter begins on a new page and contains conceptual explanation.
- Original vector diagrams and two worked examples appear in every chapter.
- Applications, misconceptions, guided reasoning and independent practice are included.
- Answers are collected at the end with method cues.
- Copyright, trademark and non-endorsement wording included.

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