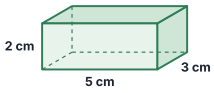
JUNIOR CYCLE MATHS · FREE REVISION SHEET

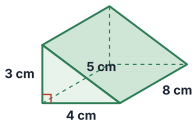
Volume, surface area & nets

↗ Léim

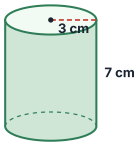
Learning outcomes (2018 specification): GT.2b, GT.2d, GT.2e. Play the game: **leim.ie/pack-it.html**



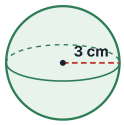
Cuboid
V = l × w × h
SA = 2(lw + lh + wh)



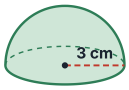
Prism
V = end area × length



Cylinder
V = πr²h
curved SA = 2πrh



Sphere
V = ⁴⁄₃πr³
SA = 4πr²



Hemisphere
V = ²⁄₃πr³
solid SA = 3πr²

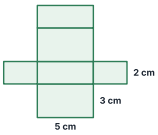
1. Volume or surface area?

Volume = the space inside (cm³, m³, litres). **Surface area** = the area of all the outside faces (cm², m²). **1 litre = 1,000 cm³ · 1 m³ = 1,000 litres**.

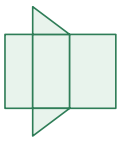
2. Prisms and cylinders

Volume = **area of the end × length**. A triangular end: ½ × base × perpendicular height (not the sloping side). A cube: V = a³, SA = 6a². A closed cylinder: SA = 2πr² + 2πrh; no lid: πr² + 2πrh.

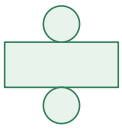
3. Nets



Cuboid: 6 rectangles



2 triangles + 3 rectangles



2 circles + 1 rectangle

The net's area = the surface area. The cylinder's rectangle is 2πr long.

4. Pack it, fill it, splash it

Boxes in a container: count along each edge, round DOWN, multiply (don't divide the volumes). **Missing length:** volume ÷ the other two. **Water rising:** rise = volume sunk ÷ base area (in a cylinder π cancels). **Combined solids:** add the parts.

5. π and units

Follow the instruction: π button, 3.14, 22/7 or in terms of π (36π stays 36π). r is the RADIUS: halve a diameter first. Round only at the end.

Higher Level: work backwards (⁴⁄₃πr³ = 288π → r³ = 216 → r = 6). Melting or recasting: the volumes are equal.

Classic mistakes: diameter used as r · forgetting a face (or the missing lid) · cm² for a volume · 1 litre = 100 cm³ · dividing volumes to count boxes · the sloping side as the height.

Exam tip: the cylinder and sphere formulas are in the *Formulae and Tables* booklet. Write the formula, put in the numbers, then the answer with units.

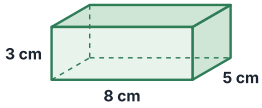
PRACTICE · 30 QUESTIONS · USE A CALCULATOR

Have a go

↗ Léim

A. Cuboids and cubes

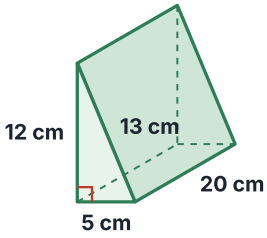
1. The cuboid in the picture (8 × 5 × 3 cm): volume. _____
2. The same cuboid: total surface area. _____
3. A cube with edges of 7 cm: volume. _____
4. The same cube: surface area. _____
5. A cuboid holds 360 cm³. It is 12 cm long and 5 cm wide. How high is it? _____
6. A tank is 50 cm × 30 cm × 40 cm. How many litres does it hold? _____
7. An open box (no lid) is 20 cm × 15 cm × 10 cm. Area of card? _____

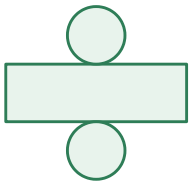


B. Prisms and nets

8. Diagram A: area of one end. _____
9. Diagram A: volume. _____
10. Diagram A: total surface area. _____
11. A prism's end has an area of 18 cm². It is 25 cm long. Volume? _____
12. A triangular prism: how many faces, edges and vertices? _____
13. Which solid does the net on the right make? _____
14. The net of a cube with edges of 4 cm: its area. _____

Diagram A

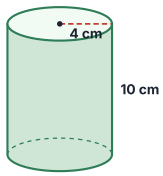




C. Cylinders and spheres

15. Diagram B: volume, in terms of π. _____
16. Diagram B: curved surface area (π button, 1 d.p.). _____
17. Diagram B: total surface area of the closed cylinder (π button, 1 d.p.). _____
18. A cylinder has a diameter of 14 cm and a height of 10 cm. Volume (π = 22/7)? _____
19. A sphere of radius 6 cm: volume, in terms of π. _____
20. A sphere of radius 5 cm: surface area (π = 3.14). _____
21. A hemisphere of radius 9 cm: volume, in terms of π. _____
22. A cylinder holds 245π cm³ and has a radius of 7 cm. Height? _____

Diagram B



D. Splash and combine

23. A tank 40 cm long and 25 cm wide holds water. A 3,000 cm³ stone sinks in. How far does the water rise? _____
24. A cylinder of radius 6 cm holds water. A ball of radius 3 cm sinks in. How far does the water rise? _____
25. How many boxes 12 × 10 × 8 cm fit in a container 50 × 30 × 24 cm, all the same way round? _____
26. A silo is a cylinder (radius 3 m, height 5 m) with a hemisphere on top. Volume, in terms of π. _____
27. *Higher Level.* A sphere has a volume of 36π cm³. Find its radius. _____

Questions 28–30 are on the next page.

EXAM-STYLE · THEN CHECK

Exam corner + answers

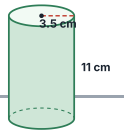
↗ Léim

E. Exam-style questions (show your work)

28. **The water trough.** A trough is a cuboid 2 m long, 0.8 m wide and 0.5 m deep. (a) Find its volume in m³. (b) How many litres does it hold? (c) A hose fills it at 20 litres a minute. How long does it take?



29. **A tin of beans.** A tin has a radius of 3.5 cm and a height of 11 cm. Use π = 22/7. (a) Find its volume. (b) The label goes all the way round the side. Find the area of the label.



30. *Higher Level.* **Melting.** A metal sphere of radius 6 cm is melted down and made into a solid cylinder of radius 4 cm. (a) Find the height of the cylinder. (b) Find the total surface area of the cylinder, in terms of π.

Answers

A	1. 120 cm³ · 2. 158 cm² · 3. 343 cm³ · 4. 294 cm² · 5. 6 cm · 6. 60 litres · 7. 1,000 cm²
B	8. 30 cm² · 9. 600 cm³ · 10. 660 cm² · 11. 450 cm³ · 12. 5, 9, 6 · 13. a cylinder · 14. 96 cm²
C	15. 160π cm³ · 16. 251.3 cm² · 17. 351.9 cm² · 18. 1,540 cm³ · 19. 288π cm³ · 20. 314 cm² · 21. 486π cm³ · 22. 5 cm
D	23. 3 cm · 24. 1 cm · 25. 36 boxes · 26. 63π m³ · 27. 3 cm
E	28. (a) 2 × 0.8 × 0.5 = **0.8 m³** (b) × 1,000 = **800 litres** (c) 800 ÷ 20 = **40 minutes** · 29. (a) 22/7 × 3.5² × 11 = **423.5 cm³** (b) 2 × 22/7 × 3.5 × 11 = **242 cm²** · 30. (a) 288π = π × 4² × h, so h = 288 ÷ 16 = **18 cm** (b) 2π × 4² + 2π × 4 × 18 = 32π + 144π = **176π cm²**

Got one wrong? Check you used the radius, then check the units. Then play **Pack It** at leim.ie/pack-it.html: the "Go back over these" list at the end shows the working for each mistake.

All questions written by Léim. Léim is independent and not connected with the State Examinations Commission or the NCCA.