UNIT 8: Perimeter, area and volume I

SPECIFICATION REFERENCES

N14 estimate answers; check calculations using approximation and estimation, including answers obtained using technology
A5 understand and use standard mathematical formulae; …
R1 change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts
G11 solve geometrical problems on coordinate axes
G12 identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres
G14 use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)
G15 measure line segments and angles in geometric figures …
G16 know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)
G17 … calculate: perimeters of 2D shapes, including … composite shapes

PRIOR KNOWLEDGE

Students should be able to measure lines and recall the names of 2D shapes.

Students should be able to use strategies for multiplying and dividing by powers of 10.

Students should be able to find areas by counting squares and volumes by counting cubes.

Students should be able to interpret scales on a range of measuring instruments.

KEYWORDS

Tier 2

Area, perimeter, surface, volume, length, convert, calculate, compound

Tier 3

Cuboid, prism, trapezium, vertices, polygon

8a. Perimeter and area (N14, A5, R1, G11, G14, G15, G16, G17)	**Teaching time** 9–11 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Indicate given values on a scale, including decimal value;
- Know that measurements using real numbers depend upon the choice of unit;
- Convert between units of measure within one system, including time;
- Convert metric units to metric units;
- Make sensible estimates of a range of measures in everyday settings;
- Measure shapes to find perimeters and areas using a range of scales;
- Find the perimeter of rectangles and triangles;
- Find the perimeter of parallelograms and trapezia;
- Find the perimeter of compound shapes;
- Recall and use the formulae for the area of a triangle and rectangle;
- Find the area of a rectangle and triangle;
- Find the area of a trapezium and recall the formula;
- Find the area of a parallelogram;
- Calculate areas and perimeters of compound shapes made from triangles and rectangles;
- Estimate surface areas by rounding measurements to 1 significant figure;
- Find the surface area of a prism;
- Find surface area using rectangles and triangles;
- Convert between metric area measures.

POSSIBLE SUCCESS CRITERIA/EXAM QUESTIONS

Find the area/perimeter of a given shape, stating the correct units.

Carpet tiles are going to be used to cover a floor.

The floor is a 1200 mm by 1000 mm rectangle.
Each carpet tile is a 40 cm by 30 cm rectangle.

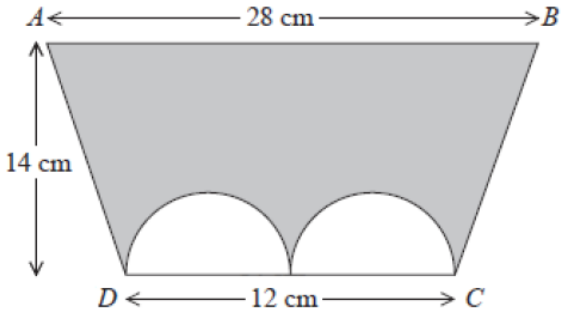
Exactly 10 carpets tiles can be used to cover the floor completely.

Show in a labelled sketch how this can be done.

(Total 3 marks)

New SAMs Paper 1F qu.15 (G14, N2, R1 – AO1/AO2)

The diagram shows a trapezium $ABCD$ and two identical semicircles.



The centre of each semicircle is on DC.

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

(Total 4 marks)

New SAMs Paper qu.18 / 3H qu.1 (G17, G16 – AO1/AO3)

OPPORTUNITIES FOR REASONING/PROBLEM SOLVING

Given two 2D that shapes have equal areas, work out all the dimensions of the sides of the shapes.

Problems involving straight-forward and compound shapes in a real-life context should be explored to reinforce the concept of area. For example, the floor plan of a garden linked to the purchase of grass seed.

COMMON MISCONCEPTIONS

Shapes involving missing lengths of sides often result in incorrect answers.

Students often confuse perimeter and area.

NOTES

Use questions that involve different metric measures that need converting.

Measurement is essentially a practical activity: use a range of everyday shapes to bring reality to lessons.

Ensure that students are clear about the difference between perimeter and area.

Practical examples help to clarify the concepts, i.e. floor tiles, skirting board, etc.

8b. 3D forms and volume (N1, R1, G12, G16)	**Teaching time** 5–7 hours

OBJECTIVES

By the end of the sub-unit, students should be able to:

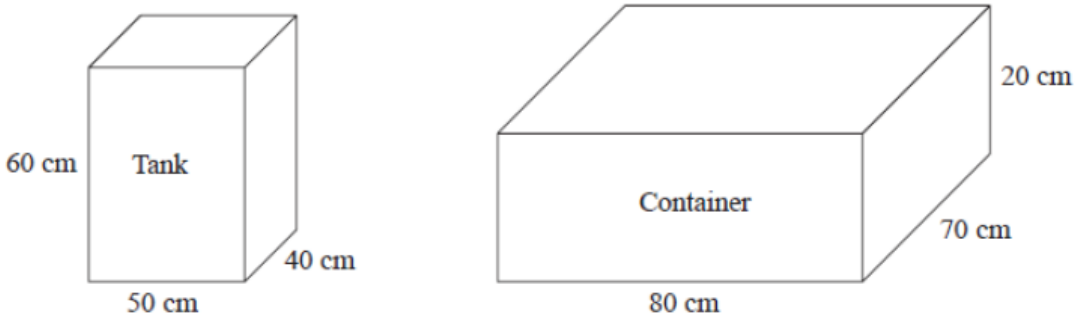
- Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone;
- Sketch nets of cuboids and prisms;
- Recall and use the formula for the volume of a cuboid;
- Find the volume of a prism, including a triangular prism, cube and cuboid;
- Calculate volumes of right prisms and shapes made from cubes and cuboids;
- Estimate volumes etc by rounding measurements to 1 significant figure;
- Convert between metric volume measures;
- Convert between metric measures of volume and capacity e.g. 1ml = 1cm^3.

POSSIBLE SUCCESS CRITERIA/EXAM QUESTIONS

Justify whether a certain number of small boxes fit inside a larger box.

Calculate the volume of a triangular prism with correct units.

The diagram shows a tank in the shape of a cuboid.
It also shows a container in the shape of a cuboid.



The tank is full of oil.
The container is empty

35% of the oil from the tank is spilled.
The rest of the oil from the tank is put into the container.

Work out the height of the oil in the container.
Give your answer to an appropriate degree of accuracy.

(Total 5 marks)

New SAMs Paper 2F qu.14 (G16, R9 – AO1/AO3)

COMMON MISCONCEPTIONS

Volume often gets confused with surface area.

NOTES

Discuss the correct use of units.

Drawings should be done in pencil.

Consider ‘how many small boxes fit in a larger box’-type questions.

Practical examples should be used to enable students to understand the difference between perimeter, area and volume.