

Year 8 - Unit 7: Area, Surface Area & Volume

Learning Journey:

Prior Learning

- Calculate the area of rectangles, triangles and compound shapes, and convert between metric units of length.
- Recognise 2D and 3D shapes and use simple geometric formulae accurately.



Next Steps

- Solve problems involving cylinders, cones, spheres and composite solids.
- Apply area, surface area and volume in GCSE geometry and real-life contexts.

By the end of this unit, you should be able to:

- Calculate the area and circumference of circles, the surface area of prisms, and the volume of prisms.
- Convert accurately between units of length, area and volume and apply these skills to multi-step problems.

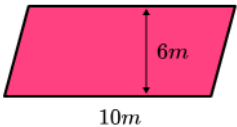
Keywords:

- Circumference** – The distance around a circle.
- Radius** – The distance from the center to the edge of a circle.
- Diameter** – The distance across a circle through the center.
- Surface area** – The total area of all the outside faces of a 3D shape.
- Prism** – A 3D shape with the same cross-section throughout.
- Volume** – The amount of space inside a 3D shape.

Area of parallelograms & trapeziums

$$\text{Area}_{\text{parallelogram}} = \text{Base} \times \text{Perpendicular Height}$$

Find the area of the parallelogram below:



$$\begin{aligned} \text{Area}_{\text{parallelogram}} &= \text{Base} \times \text{Perpendicular Height} \\ &= 10 \times 6 \\ &= 60 \end{aligned}$$

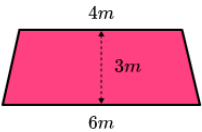
$$\text{Area}_{\text{Trapezium}} = \frac{a+b}{2} \times h$$

Where a and b are the parallel sides

Where h is equal to the perpendicular height of the trapezium
Find the area of the trapezium below:

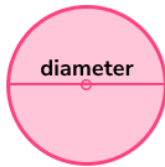
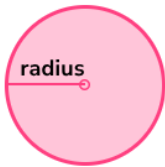
$$\frac{(4 + 6) \times 3}{2}$$

$$\frac{10}{2} \times 3 = 5 \times 3 = 15\text{m}^2$$



Area and Circumference of a circle

The diameter is twice the radius.



E.g.

What is the area of a circle with radius 3cm?



What is the circumference of the circle on the left?

$$\begin{aligned} \text{Area} &= \pi r^2 \\ &= \pi \times 3^2 \\ &= 9\pi\text{cm}^2 \\ &= 28.3\text{cm}^2(1.d.p) \end{aligned}$$

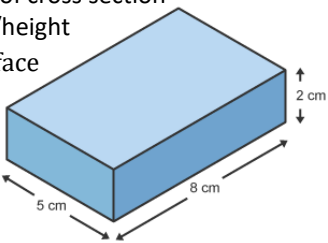
$$\begin{aligned} \text{Circumference} &= C = \pi D \\ D &= 3 \times 2 = 6 \\ C &= \pi \times 6 = 18.849555 \\ C &= 18.8\text{cm}(1.d.p) \end{aligned}$$

Volume & surface area of a prism

Volume of a prism:

- Work out the area of cross section
- Multiply by length/height

Find the volume and surface area of the cuboid.



$$\text{Volume} = \text{length} \times \text{breadth} \times \text{height}$$

For this cuboid:

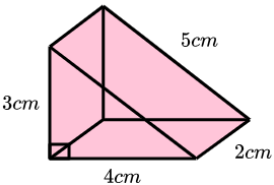
$$\begin{aligned} \text{Volume} &= 8 \times 5 \times 2 \\ &= 80\text{cm}^3 \end{aligned}$$

Surface area of a prism:

- Work out the area of cross section
- Multiply by length/height

$$\begin{aligned} \text{Surface area} &= 2lw + 2lh + 2wh \\ \text{SA} &= 2 \times 8 \times 5 + 2 \times 8 \times 2 + 2 \times 5 \times 2 \\ \text{SA} &= 80 + 32 + 20 = 132\text{cm}^2 \end{aligned}$$

Work out the volume & surface area of the prism.



$$\text{Volume} = \frac{1}{2}bh \times l = \frac{1}{2} \times 4 \times 3 \times 2 = 12\text{cm}^3$$

$$\begin{aligned} \text{Surface Area} &= \frac{(4 \times 3)}{2} + \frac{(4 \times 3)}{2} \\ &+ 3 \times 2 + 5 \times 2 + 4 \times 2 = 36\text{cm}^2 \end{aligned}$$

$(10)^2 \text{ mm}^2 = 1 \text{ cm}^2$	→	$100 \text{ mm}^2 = 1 \text{ cm}^2$
$(100)^2 \text{ cm}^2 = 1 \text{ m}^2$	→	$10\,000 \text{ cm}^2 = 1 \text{ m}^2$
$(1000)^2 \text{ m}^2 = 1 \text{ km}^2$	→	$1\,000\,000 \text{ m}^2 = 1 \text{ km}^2$
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