

Volume

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

- *calculate the volume of a sphere, cone, pyramid and prism;*
- *calculate an unknown dimension given the volume of a solid;*
- *calculate the volume of composite solids.*

Key point

Volume of a Cuboid = lbh

Volume of a Cylinder = $\pi r^2 h$

Volume of a Cone = $\frac{1}{3}\pi r^2 h$

Volume of a pyramid = $\frac{1}{3} \times \text{Area of the base} \times \text{height}$

Volume of a Sphere = $\frac{4}{3}\pi r^3$

Volume of a prism = area of the constant cross-section \times length

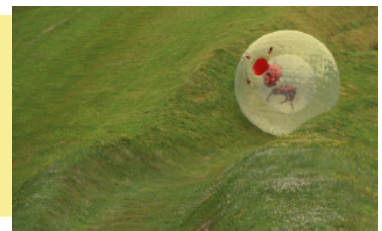
Remember:

Only the formulae for Cone, Pyramid and Sphere are given on the National 5 formula sheet. The rest *must* be remembered.

Example 1

Zorbing is an adventure sport that involves rolling downhill in a giant inflatable sphere.

Calculate the volume of a Zorb with a radius of 1.5 metres.
Write your answer correct to 1 decimal place.



Example 2

Calculate the radius of a Zorb with volume of 20 m^3 .

Example 3



This metal container has a radius of 20cm. The height is 49cm. Calculate the volume that the container can hold.

Round your answer to 2 significant figures.

Example 4

This bin holds 12 litres of waste.

The height of the bin is 40cm.

What is the radius of the bin?



Example 5



A party hat has radius of 42mm and height of 110mm. Calculate the volume of the party hat. Round your answer to 3 significant figures.

Example 6



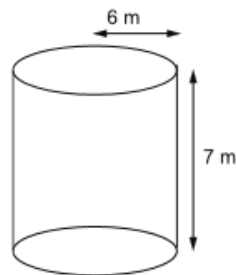
The volume of an ice cream cone is 314cm^3 and the radius is 5cm. Calculate the height of the cone. Round your answer to 2 significant figures.

Q26:

Volume of a cylinder

Find the volume of a cylinder with a radius of 6 m and a height of 7 m.

What is the volume of the cylinder in m^3 ?
Give your answer correct to **1 decimal place**.



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Q27:

Volume of a cone

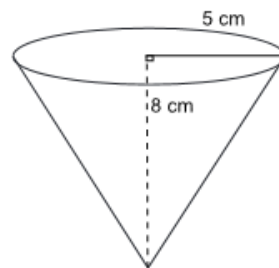
The formula for the volume of a cone is

$$V = \frac{1}{3}\pi r^2 h$$

where r is the radius and h is the height of the cone.

Find the volume of a cone with a radius of 5 cm and a height of 8 cm.

What is the volume of the cone, in cm^3 , correct to **2 decimal places**?



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Q28:

Volume of a sphere

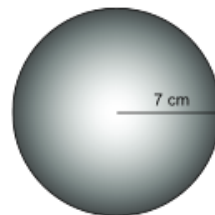
The formula for the volume of a sphere is

$$V = \frac{4}{3}\pi r^3$$

where r is the radius of the sphere.

A sphere has a radius of 7 cm.

What is the volume of the sphere, in cm^3 , correct to the **nearest whole number**?



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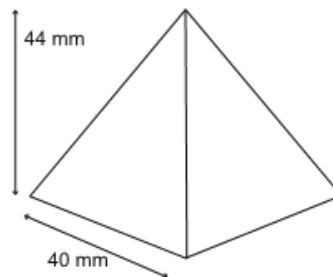
Q29:

Volume of a pyramid

A Paperweight in the shape of a square-based pyramid has length 40 mm and height 44 mm.

Calculate the volume of the paperweight.

Give your answer correct to 3 significant figures.



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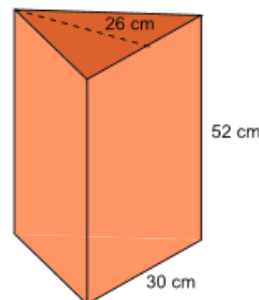
Q30:

Volume of a prism

A wastepaper bin is in the shape of a triangular prism.

It is 52 cm tall and has a triangular base of side 30 cm and height 26 cm.

Calculate the volume of the wastepaper bin.



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Q31:

Finding the height of a solid

The glass beaker holds 1400 ml. If the radius is 5.2 cm, calculate the height of the beaker.

Give your answer correct to 1 decimal place. (Hint: 1 ml = 1 cm³)



Finding the radius of a solid

A globe of the world has a volume of 65500 cm^3 , calculate the radius of the globe correct to the nearest centimetre.



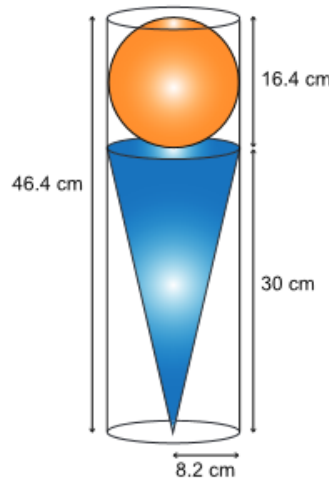
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Q33:

Volume of a composite solid

A cone and a sphere are placed inside a cylinder.

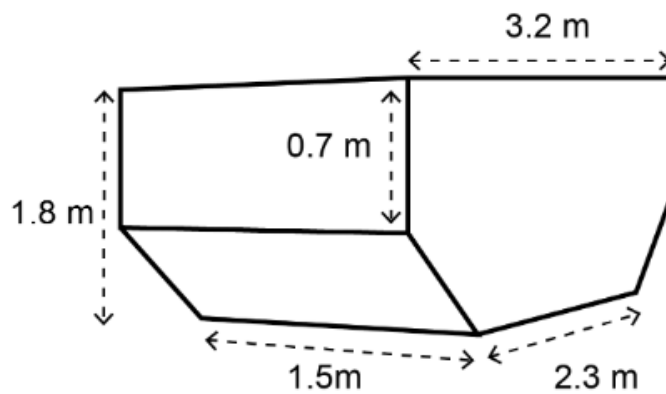
Calculate the volume of space not used in the cylinder correct to 3 significant figures.



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Q34:

An airline container is in the shape of a prism.



Calculate the volume of the airline container correct to 2 significant figures.

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Answers

Q26: 791.7 m^3

Q27: 209.44 cm^3

Q28: 1437 cm^3

Q29: 23500 mm^3

Q30: 20280 cm^3

Q31: 16.5 cm^3

Q32: 25 cm

Q33:

Steps:

- Volume of the cylinder correct to 4 significant figures = 9802 cm^3
- Volume of the cone correct to 4 significant figures = 2112 cm^3
- Volume of the sphere correct to 4 significant figures = 2310 cm^3

Answer: Volume of space not used in the cylinder = 5380 cm^3

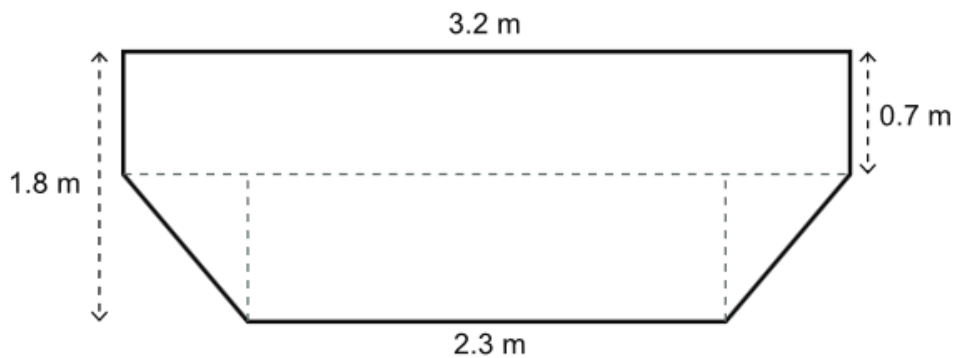
Q34:

Hint:

- Split the area of the front of the container up into smaller familiar shapes.

Steps:

a)



- b) Area of the large rectangle correct to ? significant figures = 2.24 m^2
c) Area of the small rectangle correct to ? significant figures = 2.53 m^2
d) Area of the two triangles correct to ? significant figures = 0.495 m^2
e) Total area of constant cross section = 5.265 m^2

Answer: Volume of airline container = 7.9 m^3