GCSE Maths – Geometry and Measures

Volume of 3D Shapes

Worksheet

NOTES

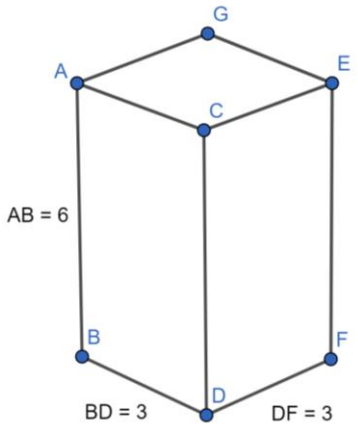
SOLUTIONS

This worksheet will show you how to work out different types of volume of 3D shapes questions. Each section contains a worked example, a question with hints and then questions for you to work through on your own.

Section A

Worked Example

Find the volume of the cuboid shown below.



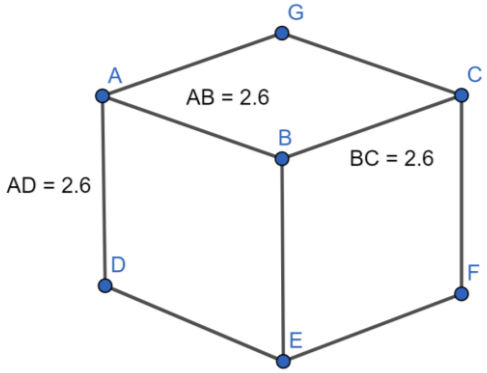
Step 1: For cuboids, use the formula: $Volume = length \times width \times height$.

We have been given the length, width, and height, so we simply multiply these together. Remember to use the correct units!

$$Volume = 6 \times 3 \times 3 = \mathbf{54\ units^3}$$

Guided Example

Find the volume of this cube.

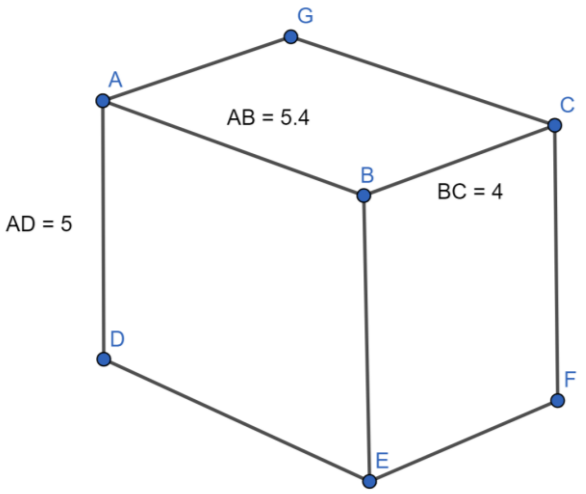


Step 1: For cuboids, use the formula: $Volume = length \times width \times height$.

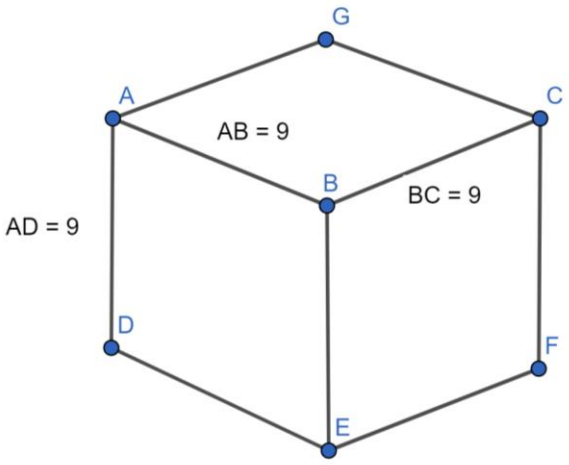
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

1. Calculate the volume of the following cubes and cuboids:

a)



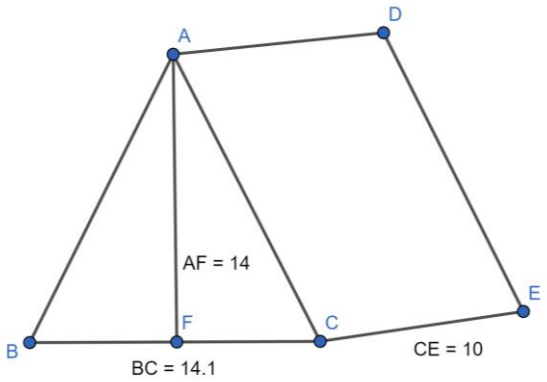
b)



Section B

Worked Example

Find the volume of this prism.



Step 1: When finding the volume of prisms and cylinders, the approach is the same: first, find the cross-sectional area.

As the cross-section here is a triangle, we use the formula for the area of a triangle:

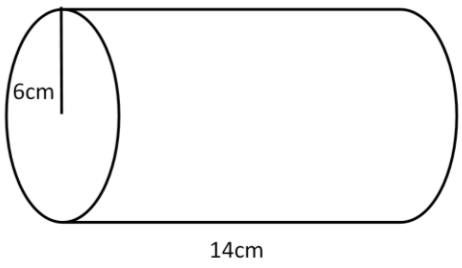
$$Area = \frac{Base \times Height}{2} = \frac{14.1 \times 14}{2} = 98.7 \text{ units}^2$$

Step 2: Multiply the cross-sectional area by the length of the prism.

$$Volume = 98.7 \times 10 = \mathbf{987 \text{ units}^3}$$

Guided Example

Find the volume of the cylinder.



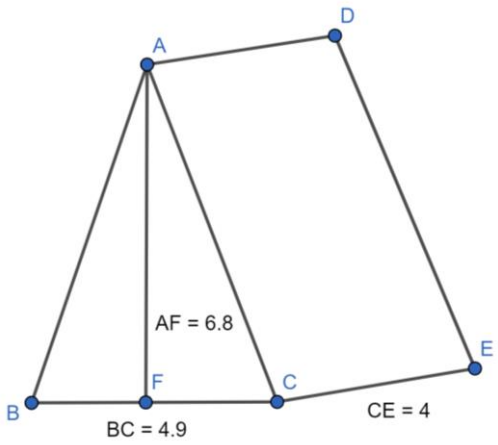
Step 1: When finding the volume of prisms and cylinders, the approach is the same: first, find the cross-sectional area.

Step 2: Multiply the cross-sectional area by the length of the cylinder.

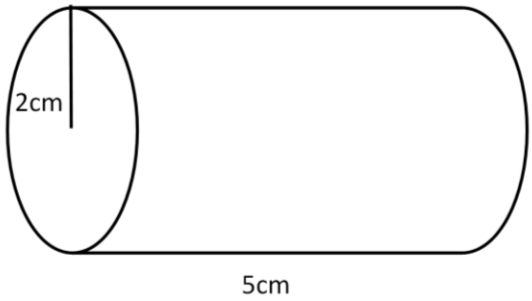
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

2. Calculate the following:

a) The volume of this prism



b) The volume of this cylinder

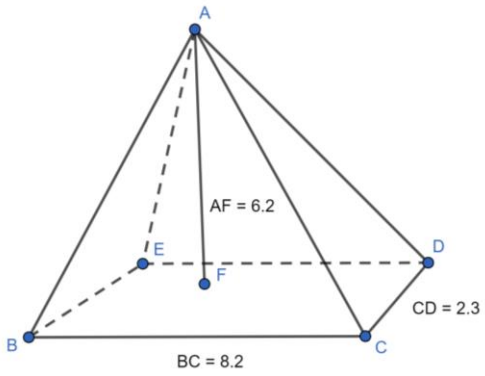


c) The length of this cylinder if the volume is 226.19 cm^3

Section C

Worked Example

Find the volume of this pyramid.



Step 1: Find the area of the base.

This is a rectangle-based pyramid. To find the area of the rectangle, we multiply the length by the width.

$$Area\ of\ base = 8.2 \times 2.3 = 18.86\ \text{units}^2$$

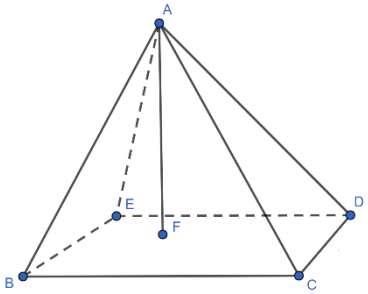
Step 2: Use the formula for the volume of a pyramid.

$$Volume = \frac{1}{3} \times Perpendicular\ height \times Area\ of\ base$$

$$Volume = \frac{1}{3} \times 6.2 \times 18.86 = \mathbf{38.98\ units^3}$$

Guided Example

Given that $\mathbf{BC = CD = 10\ cm}$ and $\mathbf{AF = 8}$, find the volume of the pyramid.



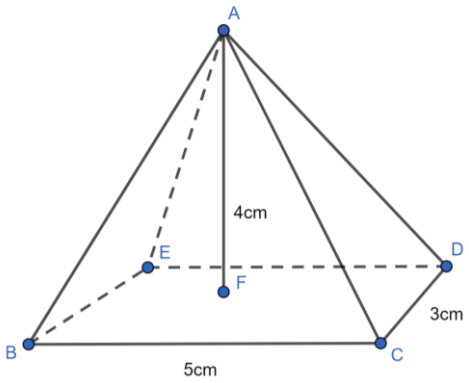
Step 1: Find the area of the base.

Step 2: Use the formula for the volume of a pyramid.

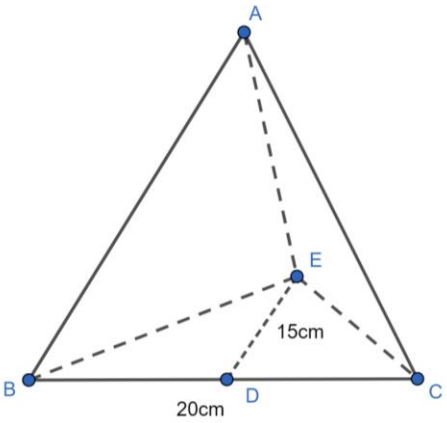
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

3. Calculate the following:

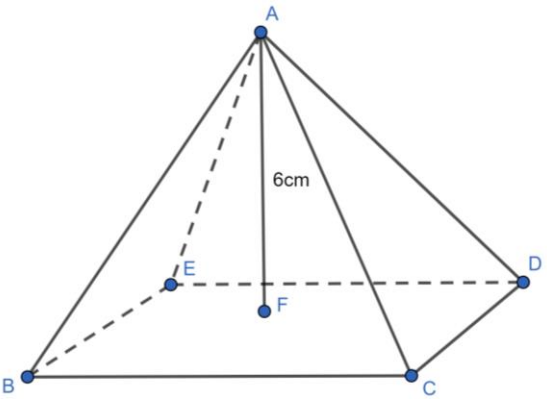
a) The volume of this pyramid



b) The perpendicular height of this triangle-based pyramid if its volume is 850 cm^3



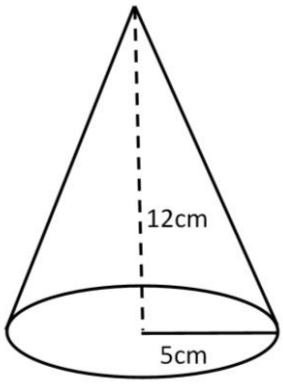
c) The length of the one of the sides of this square-based pyramid, if the total volume is 128 cm^3



Section D

Worked Example

Find the volume of the cone.



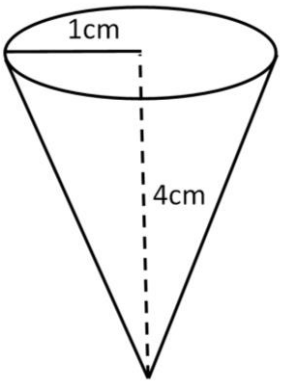
Step 1: Use the formula for the volume of a cone: $Volume = \frac{1}{3}\pi \times r^2 \times h$

Substitute the values we know into the formula to find the volume:

$$Volume = \frac{1}{3} \times \pi \times 5^2 \times 12 = \mathbf{314.16\ cm^3}$$

Guided Example

Find the volume of the cone.

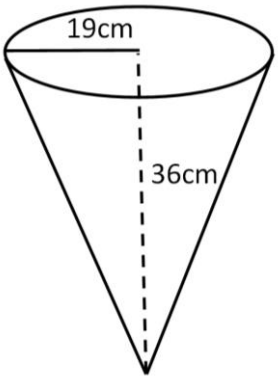


Step 1: Use the formula for the volume of a cone: $Volume = \frac{1}{3}\pi \times r^2 \times h$

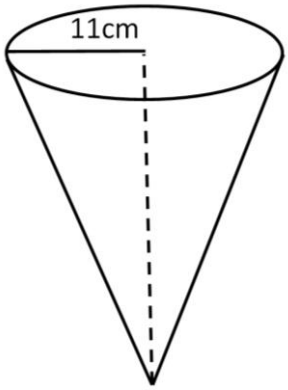
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

4. Calculate the following:

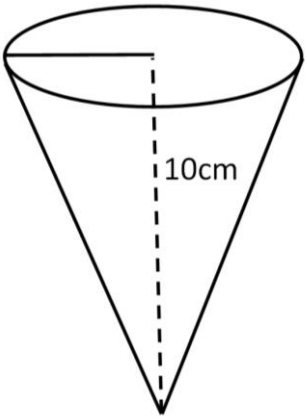
a) The volume of this cone



b) The height of this cone if its volume is 2534.22 cm^3



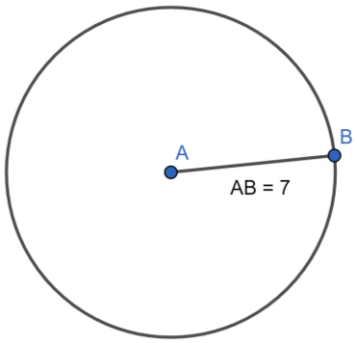
c) The radius of this cone if its volume is 167.55 cm^3



Section E

Worked Example

Find the volume of the sphere, given that point A is centred at the origin.



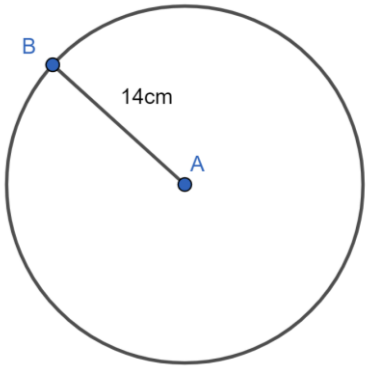
Step 1: Use the formula for the volume of a sphere: $Volume = \frac{4}{3} \times \pi \times r^3$

Substitute the values we know into the formula to find the volume:

$$Volume = \frac{4}{3} \times \pi \times 7^3 = \mathbf{1436.76\ units^3}$$

Guided Example

Find the volume of the sphere, given that point A is centred at the origin.

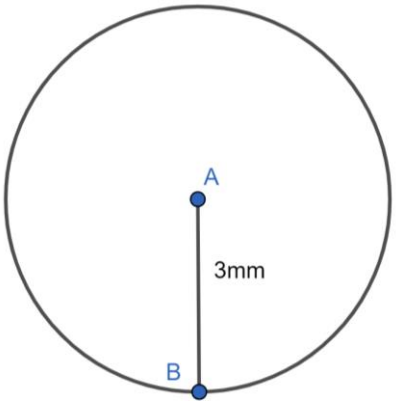


Step 1: Use the formula for the volume of a sphere: $Volume = \frac{4}{3} \times \pi \times r^3$

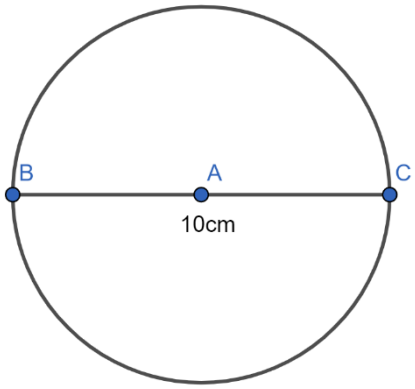
Now it's your turn!
If you get stuck, look back at the worked and guided examples.

5. Calculate the following:

   a) The volume of this sphere



   b) The volume of this sphere



6. A sphere has volume 3053.63 cm^3. Calculate the radius of the sphere.