



National 5 Mathematics

Volume - Solutions

Marks are indicated in brackets after each question number

2014 Paper 2 Question 7, (5)

$$\begin{aligned}\text{Volume of cone} &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3}\pi \times 4^2 \times 15 = 251.3 \text{ cm}^3.\end{aligned}$$

$$\begin{aligned}\text{Volume of hemisphere} &= \frac{4}{3}\pi r^3 \div 2 \\ &= \frac{4}{3}\pi \times 3.7^3 \div 2 \\ &= 106.1 \text{ cm}^3.\end{aligned}$$

$$\text{Volume of glass part} = 251.3 - 106.1 = 145.2 \text{ cm}^3.$$

2015 Paper 2 Question 6, (3) (2)

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

$$\begin{aligned}\text{Volume of the Earth} &= \frac{4}{3}\pi \times 6,400^3 \\ &= 1,098,066,219,443 \\ &= 1,100,000,000,000 \\ &= 1.1 \times 10^{12}.\end{aligned}$$

b) $\frac{1.1 \times 10^{12}}{2.2 \times 10^{10}} = 0.5 \times 10^2 = 0.5 \times 100 = 50$

So, 50 times

2016 Paper 2 Question 7, (5)

$$\begin{aligned}\text{Volume of large cone} &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3} \times \pi \times 16^2 \times 24 \\ &= 6,400 \text{ cm}^3 \text{ to 2 s.f.}\end{aligned}$$



$$\begin{aligned}\text{Volume of small cone} &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3} \times \pi \times 9^2 \times 13.5 \\ &= 1,100 \text{ cm}^3 \text{ to 2 s.f.}\end{aligned}$$

$$\text{Volume of carton} = 6,400 - 1,100 = 5,300 \text{ cm}^3 \text{ to 2 s.f.}$$

2017 Paper 2 Question 6, (5)

$$\text{Volume of outer sphere} = \frac{4}{3} \times \pi \times 12^3 = 7,240 \text{ mm}^3.$$

$$\text{Volume of inner sphere} = \frac{4}{3} \times \pi \times 9^3 = 3,050 \text{ mm}^3.$$

$$\text{Volume of coating} = 7,240 - 3,050 = 4,190 \text{ mm}^3.$$

2018 Paper 1 Question 17, (3)

$$\text{Volume} = \frac{1}{3}Ah$$

$$138 = \frac{1}{3} \times 6^2 \times h$$

$$138 = 12h$$

$$h = \frac{138}{12} = \frac{69}{6} = 11.5$$

$$h = 11.5 \text{ cm}$$

2018 Paper 2 Question 7, (3)

$$\begin{aligned}v &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \pi \times 3.2^3 \\ &= 137.2582 \\ &= 140 \text{ cm}^3\end{aligned}$$

2018 Paper 2 Question 11, (3)

$$85\% = 9.3 \times 10^{11}$$

$$1\% = (9.3 \times 10^{11}) \div 85$$

$$\begin{aligned}100\% &= [(9.3 \times 10^{11}) \div 85] \times 100 \\ &= 1,094,117,647,058 = 1.09 \times 10^{12}\end{aligned}$$

**2019 Paper 2 Question 8, (5)**

$$\begin{aligned}\text{Volume of hemi-sphere} &= \frac{1}{2} \times \frac{4}{3} \pi r^3 \\ &= \frac{1}{2} \times \frac{4}{3} \times \pi \times (12^3) \\ &= 3,619.11 \text{ cm}^3.\end{aligned}$$

$$\begin{aligned}\text{Volume of cylinder} &= \pi r^2 h \\ &= \pi \times (12^2) \times (70 - 12) \\ &= 26,238.58 \text{ cm}^3.\end{aligned}$$

$$\text{Volume of bollard} = 3,619.11 + 26,238.58 = 29,857.69 \text{ cm}^3.$$

2022 Paper 1 Question 3, (2)

$$\begin{aligned}\text{Volume} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (10^2) (60) \\ &= \frac{1}{3} \pi (100) (60) \\ &= 2000 \pi \\ &= 2000 \times 3.14 \\ &= 6,280 \text{ cm}^3\end{aligned}$$

2022 Paper 2 Question 3, (3)

$$\begin{aligned}\text{Volume of Sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \pi \times 0.2^3 \\ &= 0.0335 \text{ m}^3\end{aligned}$$

$$\begin{aligned}\text{Volume of Cuboid} &= l \times b \times h \\ &= 0.48 \times 0.48 \times 2 \\ &= 0.4608 \text{ m}^3\end{aligned}$$

$$\text{Total volume of concrete needed} = 0.0335 + 0.4608 = 0.4943 \text{ m}^3$$



2023 Paper 2 Question 9, (4)

The block is a pyramid with a smaller pyramid removed from the top.

$$\begin{aligned}\text{Volume of large pyramid} &= \frac{1}{3} \times 90^2 \times 108 \\ &= 291,600 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Volume of small pyramid} &= \frac{1}{3} \times 40^2 \times 48 \\ &= 25,600 \text{ cm}^3\end{aligned}$$

$$\text{Volume of block} = 291,600 - 25,600 = 266,000 \text{ cm}^3$$

2024 Paper 2 Question 7, (4)

$$\text{Volume of the cuboid} = 7 \times 7 \times 4 = 196 \text{ cm}^3$$

$$\begin{aligned}\text{Volume of the hemisphere} &= \frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3 \\ &= 56.548 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Volume of clear class} &= 196 - 56.548 \\ &= 139.452 \\ &= 140 \text{ cm}^3 \text{ to 2 significant figures}\end{aligned}$$

2025 Paper 2 Question 2, (3)

$$\begin{aligned}\text{Volume} &= \frac{4}{3} \times \pi \times 10.5^3 = 4,849 \\ &= 4,850 \text{ to 3 significant figures}\end{aligned}$$