

Volume and Surface Area

GCSE Mathematics • Foundation Tier • Grades 4–5 • Non-calculator

WORKED SOLUTIONS

Name: _____ *worked example* _____

Class:

Total: _____ *58* _____ / 58

Show all your working. Marks are given for correct method as well as the final answer.

1. Work out the volume of a cuboid 5 cm by 4 cm by 3 cm. [2 marks]

$$5 \times 4 \times 3 = 60$$

Answer: _____ *60* _____ cm^3

2. Work out the volume of a cube of side 6 cm. [2 marks]

$$6^3 = 216$$

Answer: _____ *216* _____ cm^3

3. Work out the surface area of a cuboid 5 cm by 4 cm by 3 cm. [3 marks]

$$\text{pairs: } 5 \times 4 = 20, 5 \times 3 = 15, 4 \times 3 = 12$$

$$20 + 15 + 12 = 47$$

$$\times 2 = 94$$

six faces, three matching pairs

Answer: _____ *94* _____ cm^2

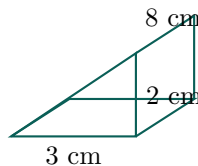
4. Work out the surface area of a cube of side 4 cm. [2 marks]

$$\text{one face} = 16$$

$$6 \times 16 = 96$$

Answer: _____ *96* _____ cm^2

5. Work out the volume of this triangular prism. [3 marks]



$$\text{cross-section} = \frac{1}{2} \times 3 \times 2 = 3$$

$$3 \times 8 = 24$$

area of cross-section $\times$ length

Answer: _____ *24* _____ cm^3

6. A prism has cross-sectional area 15 cm^2 and length 9 cm. Work out its volume. [2 marks]

$$15 \times 9 = 135$$

Answer: _____ *135* _____ cm^3

7. Work out the volume of a cylinder with radius 3 cm and height 10 cm, in terms of π . [3 marks]

$$V = \pi r^2 h$$

$$\pi \times 9 \times 10 = 90\pi$$

Answer: _____ *90 π* _____ cm^3

8. Work out the volume of a cylinder with radius 5 cm and height 8 cm, to 1 decimal place. [3 marks]

$$\pi \times 25 \times 8 = 628.31... \\ = 628.3$$

Answer: _____ **628.3** _____ cm^3

9. Work out the curved surface area of a cylinder with radius 4 cm and height 7 cm, in terms of π . [3 marks]

$$CSA = 2\pi rh \\ 2 \times \pi \times 4 \times 7 = 56\pi$$

Answer: _____ **56 π** _____ cm^2

10. Work out the total surface area of a cylinder with radius 3 cm and height 5 cm, in terms of π . [4 marks]

$$\text{curved: } 2\pi(3)(5) = 30\pi \\ \text{two circles: } 2 \times \pi(9) = 18\pi \\ 30\pi + 18\pi = 48\pi \\ \text{do not forget the two ends}$$

Answer: _____ **48 π** _____ cm^2

11. Work out the volume of a sphere of radius 3 cm, in terms of π . [3 marks]

$$V = \frac{4}{3}\pi r^3 \\ \frac{4}{3} \times \pi \times 27 = 36\pi$$

Answer: _____ **36 π** _____ cm^3

12. Work out the volume of a cone with radius 6 cm and height 10 cm, in terms of π . [3 marks]

$$V = \frac{1}{3}\pi r^2 h \\ \frac{1}{3} \times \pi \times 36 \times 10 = 120\pi$$

Answer: _____ **120 π** _____ cm^3

13. Work out the volume of a square-based pyramid with base side 6 cm and height 7 cm. [3 marks]

$$V = \frac{1}{3} \times \text{base area} \times \text{height} \\ \frac{1}{3} \times 36 \times 7 = 84$$

Answer: _____ **84** _____ cm^3

14. A cuboid has volume 120 cm^3 , length 6 cm and width 4 cm. Work out its height. [3 marks]

$$6 \times 4 = 24 \\ 120 \div 24 = 5$$

Answer: _____ **5** _____ cm

15. A cube has volume 343 cm^3 . Work out its side length. [2 marks]

$$\text{cube root of } 343 \\ = 7$$

Answer: _____ **7** _____ cm

16. A cylinder has volume $100\pi \text{ cm}^3$ and radius 5 cm. Work out its height. [3 marks]

$$\pi(25)h = 100\pi \\ 25h = 100 \\ h = 4$$

Answer: _____ **4** _____ cm

17. Convert 3 000 cm³ into litres.

[2 marks]

$$1000 \text{ cm}^3 = 1 \text{ litre}$$
$$3000 \div 1000 = 3$$

Answer: _____ 3 litres _____

18. Convert 2 m³ into cm³.

[2 marks]

$$1 \text{ m}^3 = 100^3 = 1000000$$

volume scales by 100^3

$$2 \times 1000000$$

Answer: _____ 2000000 cm³ _____

19. A water tank is a cuboid 80 cm by 50 cm by 40 cm.

(a) Work out its volume in cm³.

[2 marks]

$$80 \times 50 \times 40$$
$$= 160000 \text{ cm}^3$$

(b) Work out its capacity in litres.

[2 marks]

$$160000 \div 1000$$
$$= 160 \text{ litres}$$

Answer: 160000 cm³ ; 160 litres

20. A cylindrical can has radius 4 cm and height 12 cm.

(a) Work out its volume to the nearest cm³.

[3 marks]

$$\pi \times 16 \times 12$$
$$= 603.18...$$
$$= 603 \text{ cm}^3$$

(b) Work out how many full cans fill a 5 litre jug.

[3 marks]

$$5 \text{ litres} = 5000 \text{ cm}^3$$
$$5000 \div 603 = 8.29...$$

FULL cans, so round down

$$8 \text{ cans}$$

Answer: _ 603 cm³ ; 8 full cans _