



- 1** A cube has sides of length 4 cm.
Work out the total surface area of the cube.

(2 marks)

One face: $4 \times 4 = 16 \text{ cm}^2$

6 faces: $6 \times 16 = 96$

96 cm^2

- 2** A cuboid measures 5 cm by 3 cm by 2 cm.
Work out the total surface area of the cuboid.
State the units of your answer.

(3 marks)

The three different faces have areas $5 \times 3 = 15 \text{ cm}^2$, $5 \times 2 = 10 \text{ cm}^2$ and $3 \times 2 = 6 \text{ cm}^2$

Each face appears twice, so total surface area = $2 \times (15 + 10 + 6)$

Total surface area = $2 \times 31 = 62 \text{ cm}^2$

62 cm^2

- 3** A cube has a volume of 64 cm^3 .
Work out the total surface area of the cube.

(3 marks)

The side length of the cube is the cube root of 64, which is 4 cm
(since $4 \times 4 \times 4 = 64$)

Each face has area $4 \times 4 = 16 \text{ cm}^2$

A cube has 6 faces, so total surface area = $6 \times 16 = 96 \text{ cm}^2$

96 cm^2

- 4 A fish tank is a cuboid with no lid. It is 80 cm long, 50 cm wide and 40 cm high.

Work out the area of glass needed to make the tank.

(3 marks)

$$\text{Base: } 80 \times 50 = 4000$$

$$2 \text{ long sides: } 2 \times 80 \times 40 = 6400$$

$$2 \text{ short sides: } 2 \times 50 \times 40 = 4000$$

No lid, so only 5 faces

$$4000 + 6400 + 4000 = 14\,400$$

$$\boxed{14\,400 \text{ cm}^2}$$

- 5 A prism has a right-angled triangle as its cross-section. The triangle has sides of length 3 cm, 4 cm and 5 cm. The prism is 10 cm long.

Work out the total surface area of the prism.

(4 marks)

Two triangle ends

$$2 \times \left(\frac{1}{2} \times 3 \times 4 \right) = 12$$

Three rectangles

$$3 \times 10 = 30$$

$$4 \times 10 = 40$$

$$5 \times 10 = 50$$

$$12 + 30 + 40 + 50 = 132$$

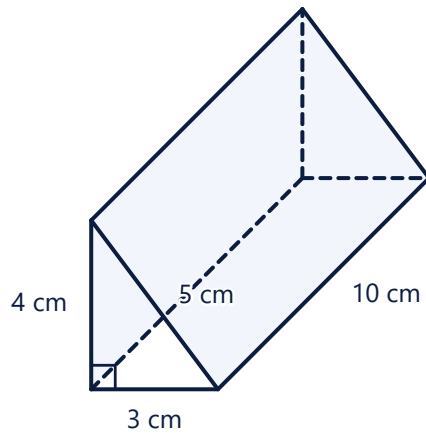
$$\boxed{132 \text{ cm}^2}$$

6

The cross-section of a triangular prism is a right-angled triangle with base 3 cm, height 4 cm and hypotenuse 5 cm.

The length of the prism is 10 cm.

Work out the total surface area of the prism.



(3 marks)

The two triangular ends each have area $\frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2$,

giving 12 cm^2 in total

The three rectangular faces have areas $3 \times 10 = 30 \text{ cm}^2$, $4 \times 10 = 40 \text{ cm}^2$ and $5 \times 10 = 50 \text{ cm}^2$

Total surface area = $12 + 30 + 40 + 50 = 132 \text{ cm}^2$

132 cm²

7

A solid is made by placing a cube of side 4 cm centrally on top of a cuboid.

The cuboid measures 8 cm by 8 cm by 2 cm, and the cube sits on the 8 cm by 8 cm face.

Work out the total surface area of the solid.

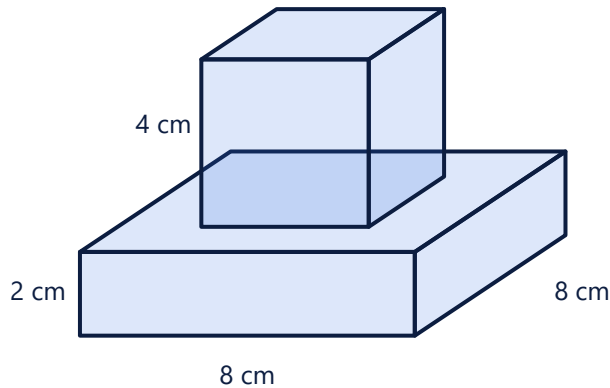


Diagram NOT accurately drawn

(4 marks)

Base of the cuboid

$$8 \times 8 = 64 \text{ cm}^2$$

Four vertical faces of the cuboid

$$4 \times (8 \times 2) = 64 \text{ cm}^2$$

Exposed top of the cuboid

$$64 - (4 \times 4) = 48 \text{ cm}^2 \text{ because the cube covers a 4 cm by 4 cm square}$$

Four vertical faces of the cube

$$4 \times (4 \times 4) = 64 \text{ cm}^2, \text{ and the top of the cube: } 4 \times 4 = 16 \text{ cm}^2$$

$$\text{Total surface area} = 64 + 64 + 48 + 64 + 16 = 256 \text{ cm}^2$$

256 cm^2

8

A solid cylinder has a radius of 6 cm and a height of 5 cm.

a. Work out the volume of the cylinder. Give your answer in terms of π .

b. Work out the total surface area of the cylinder. Give your answer in terms of π .

(4 marks)

$$a) \text{ Volume} = \pi r^2 h = \pi \times 36 \times 5 = 180\pi \text{ cm}^3$$

$$b) \text{ The two circular ends have total area } 2\pi r^2 = 2 \times \pi \times 36 = 72\pi \text{ cm}^2$$

$$\text{The curved surface has area } 2\pi r h = 2 \times \pi \times 6 \times 5 = 60\pi \text{ cm}^2$$

$$\text{Total surface area} = 72\pi + 60\pi = 132\pi \text{ cm}^2$$

Unrolling the curved surface produces a rectangle whose width is the circumference $2\pi r$ and whose height is h . Its area is therefore $2\pi r h$

9

A closed wooden box is a cuboid measuring 40 cm by 25 cm by 20 cm.

Amira varnishes all 6 faces of each box.

One tin of varnish covers 5000 cm^2 .

Amira has 3 tins of varnish.

Work out the greatest number of boxes Amira can varnish completely.

(4 marks)

$$\text{Surface area of one box} = 2 \times (40 \times 25 + 40 \times 20 + 25 \times 20) = 2 \times (1000 + 800 + 500) = 4600 \text{ cm}^2$$

$$3 \text{ tins cover } 3 \times 5000 = 15000 \text{ cm}^2$$

$$15000 \div 4600 = 3.26\dots, \text{ so Amira can varnish 3 complete boxes}$$

3

- 10 A closed cylindrical water tank has radius 40 cm and height 90 cm.

One tin of paint covers 3.5 m^2 .

Is one tin of paint enough to paint the whole outside of the tank, including the top and bottom, with one coat? You must show your working.

(4 marks)

Two circles

$$2 \times \pi \times 40^2 = 3200\pi$$

Curved surface

$$2 \times \pi \times 40 \times 90 = 7200\pi$$

$$3200\pi + 7200\pi = 10400\pi = 32673 \text{ cm}^2$$

Change to m^2 : $\div 10000$

$$32673 \div 10000 = 3.27 \text{ m}^2$$

3.27 is less than 3.5

Yes, one tin is enough

- 11 A cube has a total surface area of 384 cm^2 .

Work out the volume of the cube.

(4 marks)

Each of the 6 faces has area $384 \div 6 = 64 \text{ cm}^2$

The side length is $\sqrt{64} = 8 \text{ cm}$

$$\text{Volume} = 8 \times 8 \times 8 = 512 \text{ cm}^3$$

512 cm³

- 12 A cuboid has a square base of side 5 cm and height $h \text{ cm}$.

The total surface area of the cuboid is 190 cm^2 .

Work out the volume of the cuboid.

(5 marks)

The top and bottom faces have total area $2 \times 5 \times 5 = 50 \text{ cm}^2$

The four vertical faces have total area $4 \times 5h = 20h \text{ cm}^2$

$$50 + 20h = 190, \text{ so}$$

$$20h = 140$$

$$\text{and } h = 7$$

cm

$$\begin{aligned} \text{Volume} &= 5 \times 5 \times 7 \\ &= 175 \text{ cm}^3 \end{aligned}$$

175 cm³

13 A cuboid has a base measuring 8 cm by 5 cm.

The volume of the cuboid is 320 cm^3 .

Work out the total surface area of the cuboid.

(5 marks)

Base area = $8 \times 5 = 40 \text{ cm}^2$, so the height = $320 \div 40 = 8 \text{ cm}$

The three different faces have areas $8 \times 5 = 40 \text{ cm}^2$, $8 \times 8 = 64 \text{ cm}^2$ and $5 \times 8 = 40 \text{ cm}^2$

Total surface area = $2 \times (40 + 64 + 40) = 2 \times 144 = 288 \text{ cm}^2$

288 cm²

14 A cuboid measures 9 cm by 3 cm by 4 cm.

A cube has sides of length 5 cm.

a. Show that the cuboid and the cube have the same total surface area.

b. Which solid has the greater volume, and by how much?

(5 marks)

a)

Cuboid: $2(27 + 36 + 12) = 2 \times 75 = 150$

Cube: $6 \times 25 = 150$

Same surface area

b)

Cuboid: $9 \times 3 \times 4 = 108$

Cube: $5 \times 5 \times 5 = 125$

$125 - 108 = 17$

The cube, by 17 cm³