

Name _____

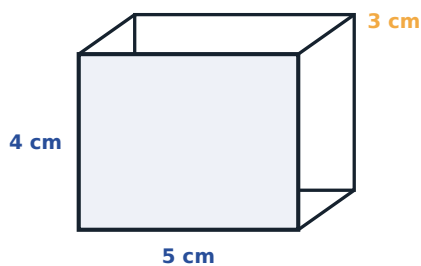
Date _____

15.5 Volume of cubes and cuboids — worked answers

Derive and use the formula for the volume of a cube or cuboid, and use it for compound solids made from cuboids. · 63 questions

A · Fluency — Volumes of cuboids and cubes, and missing dimensions.

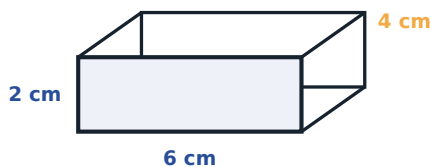
- 1 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 60

Volume of a cuboid = length $\times$ width $\times$ height: $5 \times 3 \times 4 = 60 \text{ cm}^3$.

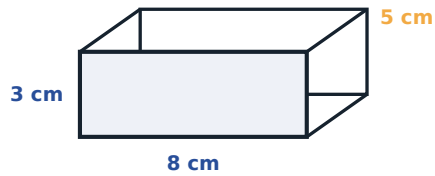
- 2 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 48

Volume of a cuboid = length $\times$ width $\times$ height: $6 \times 4 \times 2 = 48 \text{ cm}^3$.

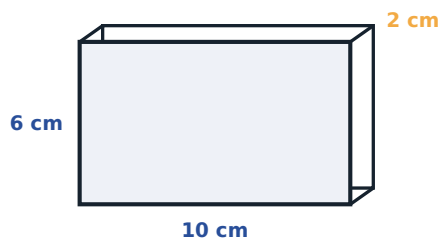
- 3 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 120

Volume of a cuboid = length $\times$ width $\times$ height: $8 \times 5 \times 3 = 120 \text{ cm}^3$.

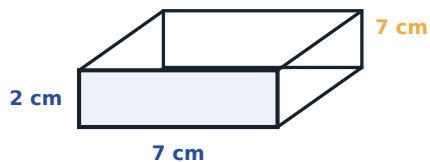
- 4 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 120

Volume of a cuboid = length $\times$ width $\times$ height: $10 \times 2 \times 6 = 120 \text{ cm}^3$.

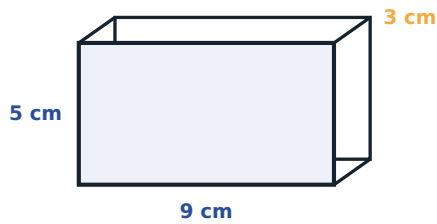
- 5 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 98

Volume of a cuboid = length $\times$ width $\times$ height: $7 \times 7 \times 2 = 98 \text{ cm}^3$.

- 6 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 135

Volume of a cuboid = length $\times$ width $\times$ height: $9 \times 3 \times 5 = 135 \text{ cm}^3$.

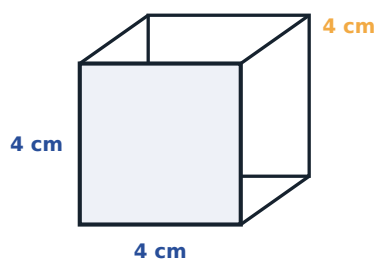
- 7 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 144

Volume of a cuboid = length $\times$ width $\times$ height: $12 \times 4 \times 3 = 144 \text{ cm}^3$.

- 8 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 64

Volume of a cuboid = length $\times$ width $\times$ height: $4 \times 4 \times 4 = 64 \text{ cm}^3$.

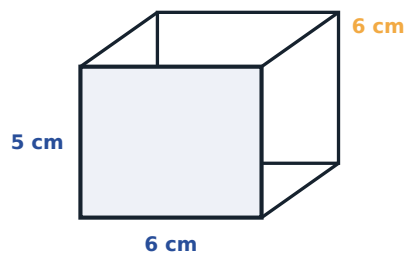
- 9 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 120

Volume of a cuboid = length $\times$ width $\times$ height: $15 \times 2 \times 4 = 120 \text{ cm}^3$.

- 10 Find the **volume** of this cuboid, in cubic centimetres.



Answer: 180

Volume of a cuboid = length $\times$ width $\times$ height: $6 \times 6 \times 5 = 180 \text{ cm}^3$.

- 11 A cube has edges of 2 cm. What is its volume, in cubic centimetres?

Answer: 8

All three edges are the same: $2 \times 2 \times 2 = 8 \text{ cm}^3$.

- 12 A cube has edges of 3 cm. What is its volume, in cubic centimetres?

Answer: 27

All three edges are the same: $3 \times 3 \times 3 = 27 \text{ cm}^3$.

- 13 A cube has edges of 4 cm. What is its volume, in cubic centimetres?

Answer: 64

All three edges are the same: $4 \times 4 \times 4 = 64 \text{ cm}^3$.

- 14 A cube has edges of 5 cm. What is its volume, in cubic centimetres?

Answer: 125

All three edges are the same: $5 \times 5 \times 5 = 125 \text{ cm}^3$.

- 15 A cube has edges of 6 cm. What is its volume, in cubic centimetres?

Answer: 216

All three edges are the same: $6 \times 6 \times 6 = 216 \text{ cm}^3$.

- 16** A cube has edges of 10 cm. What is its volume, in cubic centimetres?

Answer: 1000

All three edges are the same: $10 \times 10 \times 10 = 1000 \text{ cm}^3$.

- 17** A cube has edges of 7 cm. What is its volume, in cubic centimetres?

Answer: 343

All three edges are the same: $7 \times 7 \times 7 = 343 \text{ cm}^3$.

- 18** A cube has edges of 8 cm. What is its volume, in cubic centimetres?

Answer: 512

All three edges are the same: $8 \times 8 \times 8 = 512 \text{ cm}^3$.

- 19** A cuboid is 5 cm long, 3 cm deep and 4 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 15

The base is a rectangle 5 cm by 3 cm: $5 \times 3 = 15 \text{ cm}^2$. Multiplying that by the height 4 would give the volume.

- 20** A cuboid is 6 cm long, 4 cm deep and 2 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 24

The base is a rectangle 6 cm by 4 cm: $6 \times 4 = 24 \text{ cm}^2$. Multiplying that by the height 2 would give the volume.

- 21** A cuboid is 8 cm long, 5 cm deep and 3 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 40

The base is a rectangle 8 cm by 5 cm: $8 \times 5 = 40 \text{ cm}^2$. Multiplying that by the height 3 would give the volume.

- 22** A cuboid is 10 cm long, 2 cm deep and 6 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 20

The base is a rectangle 10 cm by 2 cm: $10 \times 2 = 20 \text{ cm}^2$. Multiplying that by the height 6 would give the volume.

- 23** A cuboid is 7 cm long, 7 cm deep and 2 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 49

The base is a rectangle 7 cm by 7 cm: $7 \times 7 = 49 \text{ cm}^2$. Multiplying that by the height 2 would give the volume.

- 24** A cuboid is 9 cm long, 3 cm deep and 5 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 27

The base is a rectangle 9 cm by 3 cm: $9 \times 3 = 27 \text{ cm}^2$. Multiplying that by the height 5 would give the volume.

- 25** A cuboid is 12 cm long, 4 cm deep and 3 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 48

The base is a rectangle 12 cm by 4 cm: $12 \times 4 = 48 \text{ cm}^2$. Multiplying that by the height 3 would give the volume.

- 26** A cuboid is 4 cm long, 4 cm deep and 4 cm tall. What is the area of the face it stands on, in square centimetres?

Answer: 16

The base is a rectangle 4 cm by 4 cm: $4 \times 4 = 16 \text{ cm}^2$. Multiplying that by the height 4 would give the volume.

- 27** A cuboid has volume 60 cm^3 , length 5 cm and width 4 cm. What is its height, in centimetres?

Answer: 3

The base area is $5 \times 4 = 20 \text{ cm}^2$, so the height is $60 \div 20 = 3 \text{ cm}$.

- 28** A cuboid has volume 144 cm^3 , length 6 cm and width 6 cm. What is its height, in centimetres?

Answer: 4

The base area is $6 \times 6 = 36 \text{ cm}^2$, so the height is $144 \div 36 = 4 \text{ cm}$.

- 29** A cuboid has volume 120 cm^3 , length 10 cm and width 3 cm. What is its height, in centimetres?

Answer: 4

The base area is $10 \times 3 = 30 \text{ cm}^2$, so the height is $120 \div 30 = 4 \text{ cm}$.

- 30** A cuboid has volume 210 cm^3 , length 7 cm and width 5 cm. What is its height, in centimetres?

Answer: 6

The base area is $7 \times 5 = 35 \text{ cm}^2$, so the height is $210 \div 35 = 6 \text{ cm}$.

- 31** A cuboid has volume 96 cm^3 , length 8 cm and width 4 cm. What is its height, in centimetres?

Answer: 3

The base area is $8 \times 4 = 32 \text{ cm}^2$, so the height is $96 \div 32 = 3 \text{ cm}$.

- 32** A cuboid has volume 180 cm^3 , length 9 cm and width 5 cm. What is its height, in centimetres?

Answer: 4

The base area is $9 \times 5 = 45 \text{ cm}^2$, so the height is $180 \div 45 = 4 \text{ cm}$.

- 33** A container holds 1000 cm^3 . How many litres is that?

Answer: 1

1 litre is 1000 cm^3 , so $1000 \div 1000 = 1 \text{ litres}$.

- 34** A container holds 2000 cm^3 . How many litres is that?

Answer: 2

1 litre is 1000 cm^3 , so $2000 \div 1000 = 2 \text{ litres}$.

- 35** A container holds 5000 cm^3 . How many litres is that?

Answer: 5

1 litre is 1000 cm^3 , so $5000 \div 1000 = 5 \text{ litres}$.

- 36** A container holds 12000 cm^3 . How many litres is that?

Answer: 12

1 litre is 1000 cm^3 , so $12000 \div 1000 = 12 \text{ litres}$.

- 37** A container holds 500 cm^3 . How many litres is that?

Answer: 0.5

1 litre is 1000 cm^3 , so $500 \div 1000 = 0.5 \text{ litres}$.

- 38** A container holds 7500 cm^3 . How many litres is that?

Answer: 7.5

1 litre is 1000 cm^3 , so $7500 \div 1000 = 7.5$ litres.

B · Reasoning — Why the units are cubes, and what the formula is really doing.

- 39** Why is volume measured in cubic centimetres?

- ☐ Because solids are cubes
- ☐ Because it counts how many 1 cm cubes fit inside
- ☐ Because of the formula
- ☐ It is just a name

Answer: Because it counts how many 1 cm cubes fit inside

Three lengths multiplied together, so three little marks: cm^3 .

- 40** Volume of a cuboid = ...

- ☐ $l + w + h$
- ☐ $2(l + w + h)$
- ☐ $l \times w \times h$
- ☐ $l \times w$

Answer: $l \times w \times h$

One factor for each of the three dimensions.

- 41** Why is the volume the base area times the height?

- ☐ It is a coincidence
- ☐ Each layer is one base area thick, and there are h layers
- ☐ Because of the units
- ☐ It is not

Answer: Each layer is one base area thick, and there are h layers

Stacking layers is the honest picture of what the formula does, and it works for any prism, not just a cuboid.

- 42** A cube has edge 4 cm. Its volume is ...

- ☐ 12 cm^3
- ☐ 16 cm^3
- ☐ 48 cm^3
- ☐ 64 cm^3

Answer: 64 cm^3

$4 \times 4 \times 4 = 64$.

- 43** Does doubling every edge of a cube double its volume?

- ☐ Yes
- ☐ No

Answer: No

It multiplies it by $2 \times 2 \times 2 = 8$. Three lengths have each doubled.

44 1 litre is ...

- ☐ 10 cm³
- ☐ 100 cm³
- ☐ 1000 cm³
- ☐ 10 000 cm³

Answer: 1000 cm³

A cube 10 cm by 10 cm by 10 cm.

45 1 m³ is how many cm³?

- ☐ 1000
- ☐ 10 000
- ☐ 100 000
- ☐ 1 000 000

Answer: 1 000 000

100 × 100 × 100. The length factor is cubed this time, not squared.

46 To find the volume of a shape made of two cuboids, you ...

- ☐ multiply the volumes
- ☐ split it and add the volumes
- ☐ average them
- ☐ subtract

Answer: split it and add the volumes

Exactly the method of section 15.2, one dimension up.

47 Do two cuboids with the same volume have to be the same shape?

- ☐ Yes
- ☐ No

Answer: No

1 × 1 × 24 and 2 × 3 × 4 both hold 24 cm³, and they look nothing alike.

48 Which unit fits the volume of a swimming pool?

- ☐ mm³
- ☐ cm³
- ☐ m³
- ☐ there is none

Answer: m³

In cm³ the number would run to the hundreds of millions.

C · Challenge — Compound solids, holes, litres and packing.

49 A shape is made from a 6 cm by 4 cm by 3 cm cuboid with a 2 cm cube stuck on top. What is its total volume, in cubic centimetres?

Answer: 80

The cuboid is $6 \times 4 \times 3 = 72$ cm³ and the cube is $2 \times 2 \times 2 = 8$ cm³, so $72 + 8 = 80$ cm³.

50 A cuboid 10 cm by 8 cm by 5 cm has a 4 cm by 4 cm by 5 cm hole right through it. What volume remains, in cubic centimetres?

Answer: 320

The cuboid is $10 \times 8 \times 5 = 400$ cm³ and the hole is $4 \times 4 \times 5 = 80$ cm³, so $400 - 80 = 320$ cm³.

- 51** A cube has volume 125 cm^3 . What is the length of one edge, in centimetres?

Answer: 5

The edge is the cube root of 125, and $5 \times 5 \times 5 = 125$, so the edge is 5 cm.

- 52** A tank is 2 m by 1 m by 0.5 m. What is its volume, in cubic metres?

Answer: 1

$2 \times 1 \times 0.5 = 1 \text{ m}^3$.

- 53** A tank is 50 cm by 40 cm by 30 cm. How many litres does it hold?

Answer: 60

$50 \times 40 \times 30 = 60000 \text{ cm}^3$, and $60000 \div 1000 = 60$ litres.

- 54** How many 2 cm cubes fit inside a 10 cm by 8 cm by 6 cm box?

Answer: 60

Along each edge: $10 \div 2 = 5$, $8 \div 2 = 4$ and $6 \div 2 = 3$, so $5 \times 4 \times 3 = 60$ cubes.

- 55** A cuboid has volume 240 cm^3 and a square base of side 4 cm. What is its height, in centimetres?

Answer: 15

The base is $4 \times 4 = 16 \text{ cm}^2$, so the height is $240 \div 16 = 15 \text{ cm}$.

D · Word problems — Boxes, tanks, pools and skips.

- 56** A box is 20 cm by 15 cm by 10 cm. What is its volume, in cubic centimetres?

Answer: 3000

$20 \times 15 \times 10 = 3000 \text{ cm}^3$.

- 57** A fish tank is 60 cm by 30 cm by 40 cm. How many litres does it hold?

Answer: 72

$60 \times 30 \times 40 = 72000 \text{ cm}^3$, and $72000 \div 1000 = 72$ litres.

- 58** A concrete block is 40 cm by 20 cm by 20 cm. What is its volume, in cubic centimetres?

Answer: 16000

$40 \times 20 \times 20 = 16000 \text{ cm}^3$.

- 59** A swimming pool is 25 m by 10 m and 2 m deep. What is its volume, in cubic metres?

Answer: 500

$25 \times 10 \times 2 = 500 \text{ m}^3$.

- 60** A lorry carries 18 m^3 of sand. Each load of a wheelbarrow is 0.09 m^3 . How many barrow loads is that?

Answer: 200

$18 \div 0.09 = 200$ loads.

- 61** A carton is 12 cm by 8 cm by 5 cm. How many fit in a crate 48 cm by 32 cm by 20 cm?

Answer: 64

Along each edge: $48 \div 12 = 4$, $32 \div 8 = 4$ and $20 \div 5 = 4$, so $4 \times 4 \times 4 = 64$ cartons.

- 62** A juice carton holds 1 litre. Its base is 10 cm by 10 cm. How tall is it, in centimetres?

Answer: 10

1 litre is 1000 cm^3 , and the base is $10 \times 10 = 100 \text{ cm}^2$, so the height is $1000 \div 100 = 10 \text{ cm}$.

- 63** A skip is 3 m by 2 m by 1 m. Rubble costs \$25 per cubic metre to remove. What does a full skip cost, in dollars?

Answer: 150

The skip holds $3 \times 2 \times 1 = 6 \text{ m}^3$, and $6 \times 25 = 150$ dollars.