Measurement: Estimating Volume

Aim:	**Success Criteria:**	**Resources:**
Estimate volume (for example, using 1 cm^3 blocks to build cuboids (including cubes)) and capacity (for example, using water). I can estimate volume using cubic centimetres (cm^3).	I can explain what volume is and measure it in cm^3. I can estimate the number of centimetre cubes needed to build shapes. I can estimate the volume of cuboids in cm^3.	**Lesson Pack** Centimetre cubes Individual whiteboards and pens – class set Scissors Glue sticks
	Key/New Words: Solid, liquid, volume, capacity, cubic centimetre, cubed, estimate.	**Preparation:** **Open Top Cube Net** – one per pair Differentiated **Estimating Volume Activity Sheet** – one per child

Prior Learning: It will be helpful if children have estimated the capacity of containers (covered in the previous lesson).

Learning Sequence

	**Fill the Bucket!** Children work out which containers they could use to fill a bucket exactly. Use the **Lesson Presentation** to discuss their answers.	
	**What Is Volume?** Use the **Lesson Presentation** to explain what is meant by capacity and what is meant by volume.	
	**How to Estimate Volume:** Children use centimetre cubes to build the shapes shown on the **Lesson Presentation**. They count how many cubes are used for each shape and write the volume of each shape in cubic centimetres (cm^3). They then look at pictures of shapes and estimate the volume in cm^3 by counting cubes without building the shapes.	
	**Estimating Capacity:** Children cut out and glue together the **Open Top Cube Net**. Get children to estimate the capacity of the cube, using enough centimetre cubes to cover the bottom layer of the cube. Encourage children to think about how many centimetre cubes would be in a layer and how many layers they think the larger cube would hold. Confirm that there would be five layers of 25 cubes to make an overall capacity of 125 cubes, or 125cm^3.	
	**Calculating and Estimating Volume:** The **Lesson Presentation** demonstrates how the volume of cubes and cuboids can be found by multiplying the length by the width and multiplying this by the height. Children calculate the volume of cuboids. If needed, children can still use cubes to build the shapes.	
	**Volume Problems:** Children predict the volume of a cuboid if its dimensions were doubled and then calculate to check their answer. Were they correct or not? Why do they think the volume has more than doubled? Then, they estimate the volume of cuboids with some cubes missing.	
	**Estimating Volume:** Children complete the differentiated **Estimating Volume Activity Sheets**, calculating and estimating the volume of a variety of shapes in cm^3. ★ Children estimate the volumes of cuboids and of two more complex shapes, using centimetre cubes to build the shapes. They estimate the volume of two cuboids if the dimensions were doubled. ★★ Children estimate the volume of cuboids and more complex shapes. They can use centimetre cubes to check their answers, if required. They estimate the volume of a cuboid if the dimensions were doubled. They estimate the volume of a cuboid with some cubes missing. ★★★ Children estimate the volume of cuboids and more complex shapes; some shapes are shown with some interior lines missing. They are encouraged to do this without using centimetre cubes. They estimate the volume of a cube if the dimensions were doubled. They estimate the volume of a cuboid with some cubes missing.	

Volume 24: Children find different possible ways to build cuboids that have a volume of 24cm^3.

Exploreit

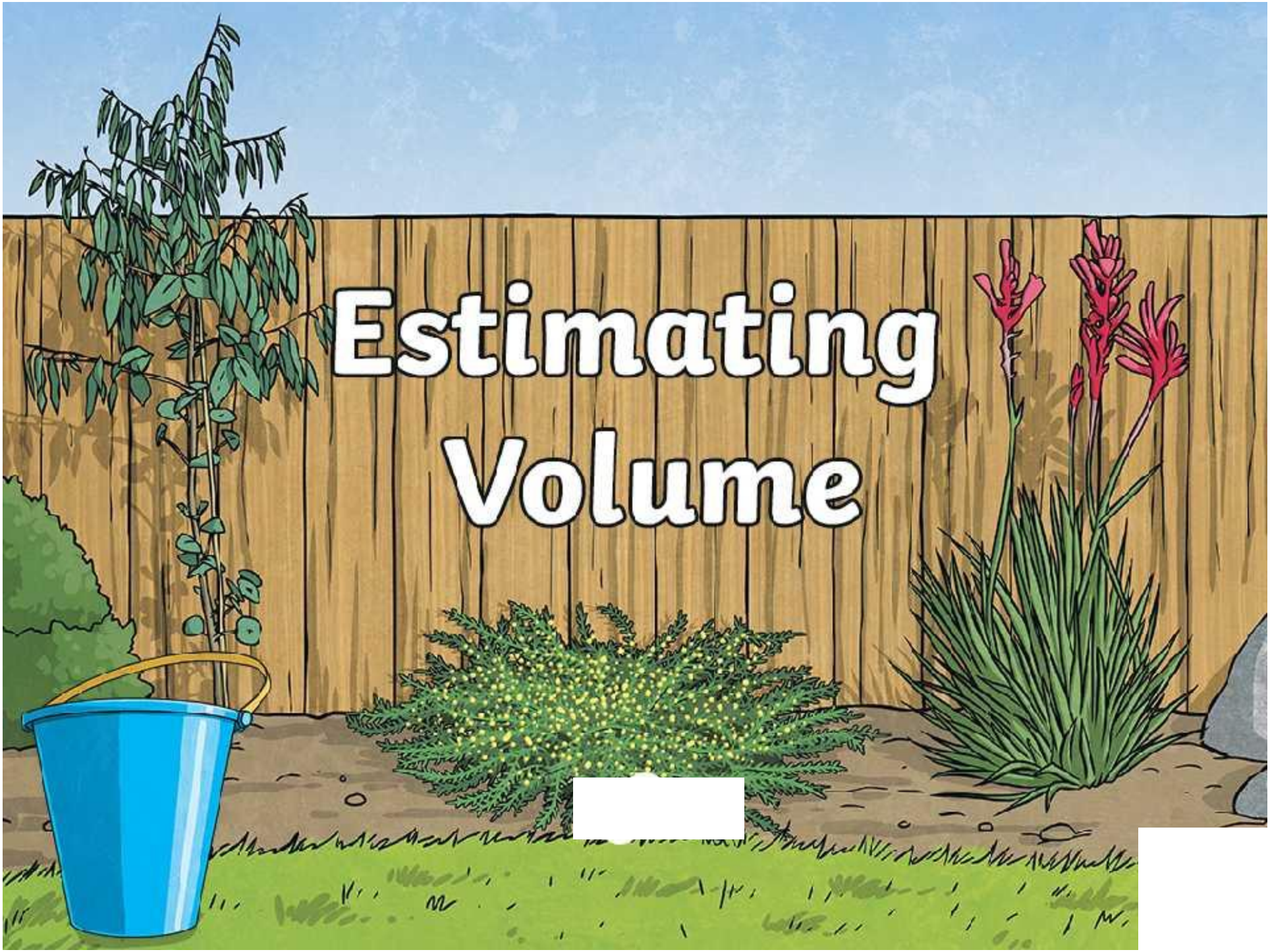
Rollit: In pairs, children roll two dice. They multiply the numbers together and each use centimetre cubes to build a shape that has a volume of the product. How many different shapes can they build that have the same volume?

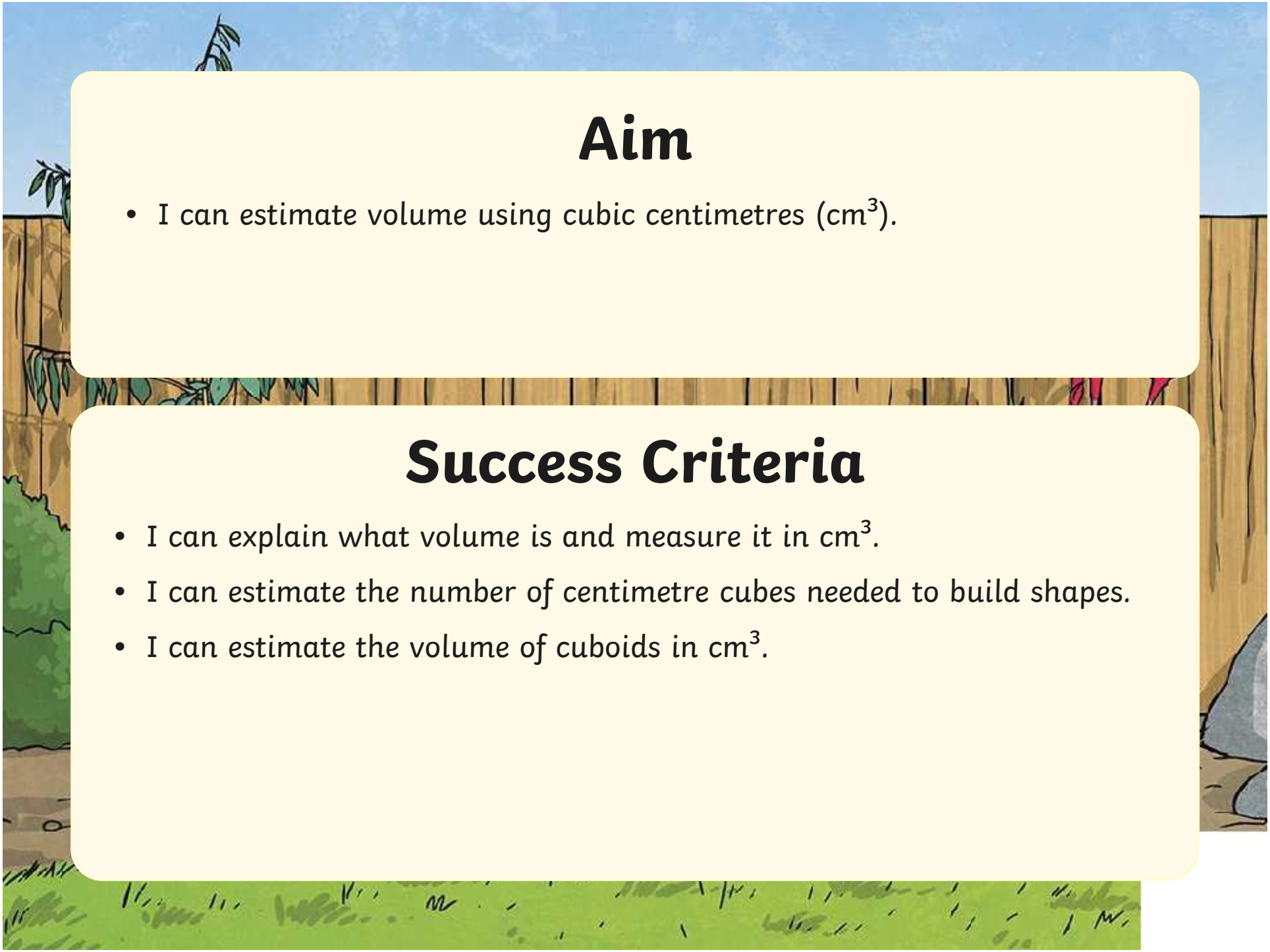
Drawit: Children draw 2D representations of some of the shapes they made throughout the lesson using **Isometric Dot Paper**. They record the volume of the shapes in cm^3.

Estimateit: Provide children with nets for open topped cubes. As in the main lesson, children use centimetre cubes to estimate each larger cube's capacity.

Maths

Measurement


Estimating
Volume



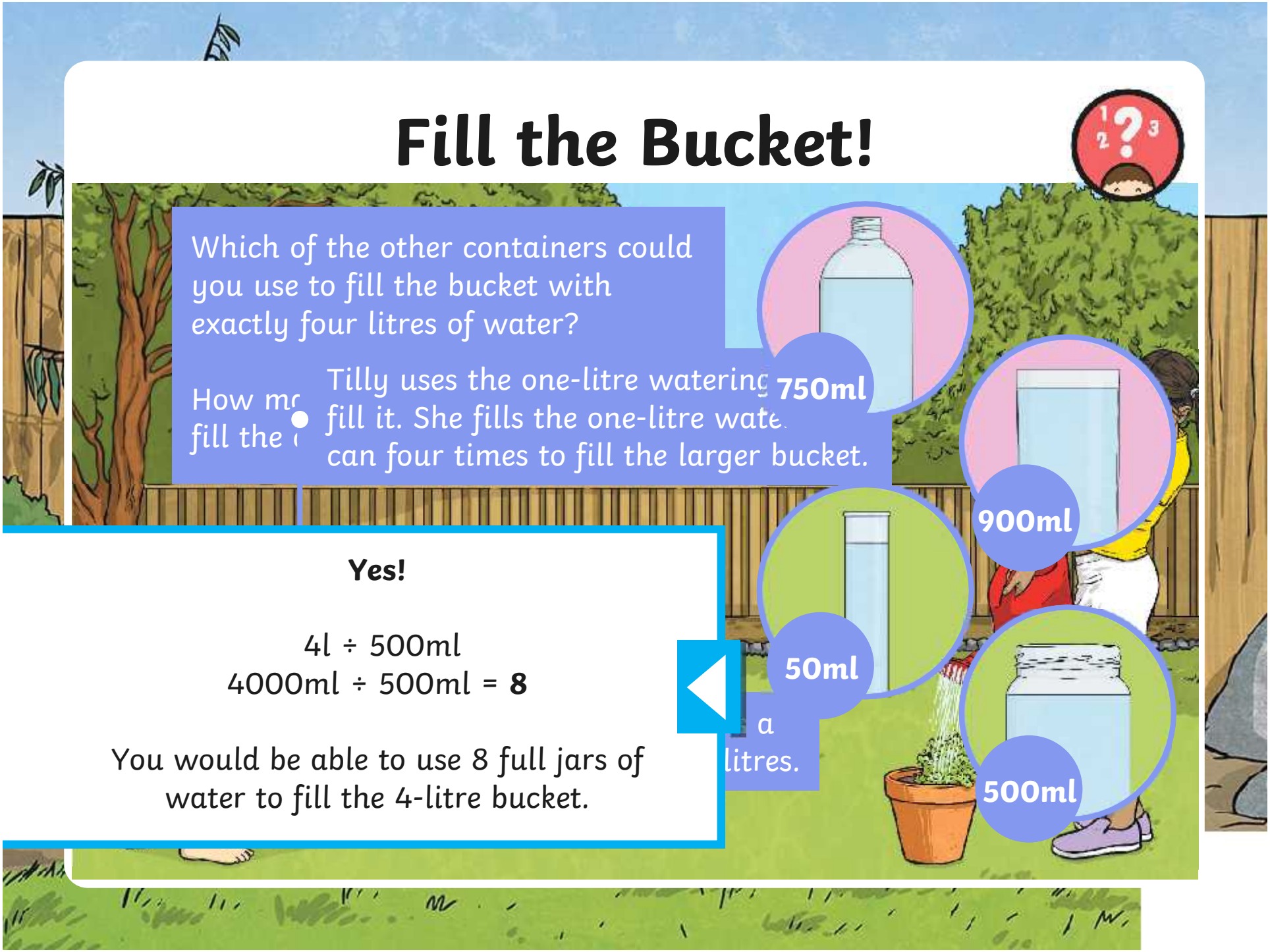
Aim

- I can estimate volume using cubic centimetres (cm^3).

Success Criteria

- I can explain what volume is and measure it in cm^3.
- I can estimate the number of centimetre cubes needed to build shapes.
- I can estimate the volume of cuboids in cm^3.

Fill the Bucket!

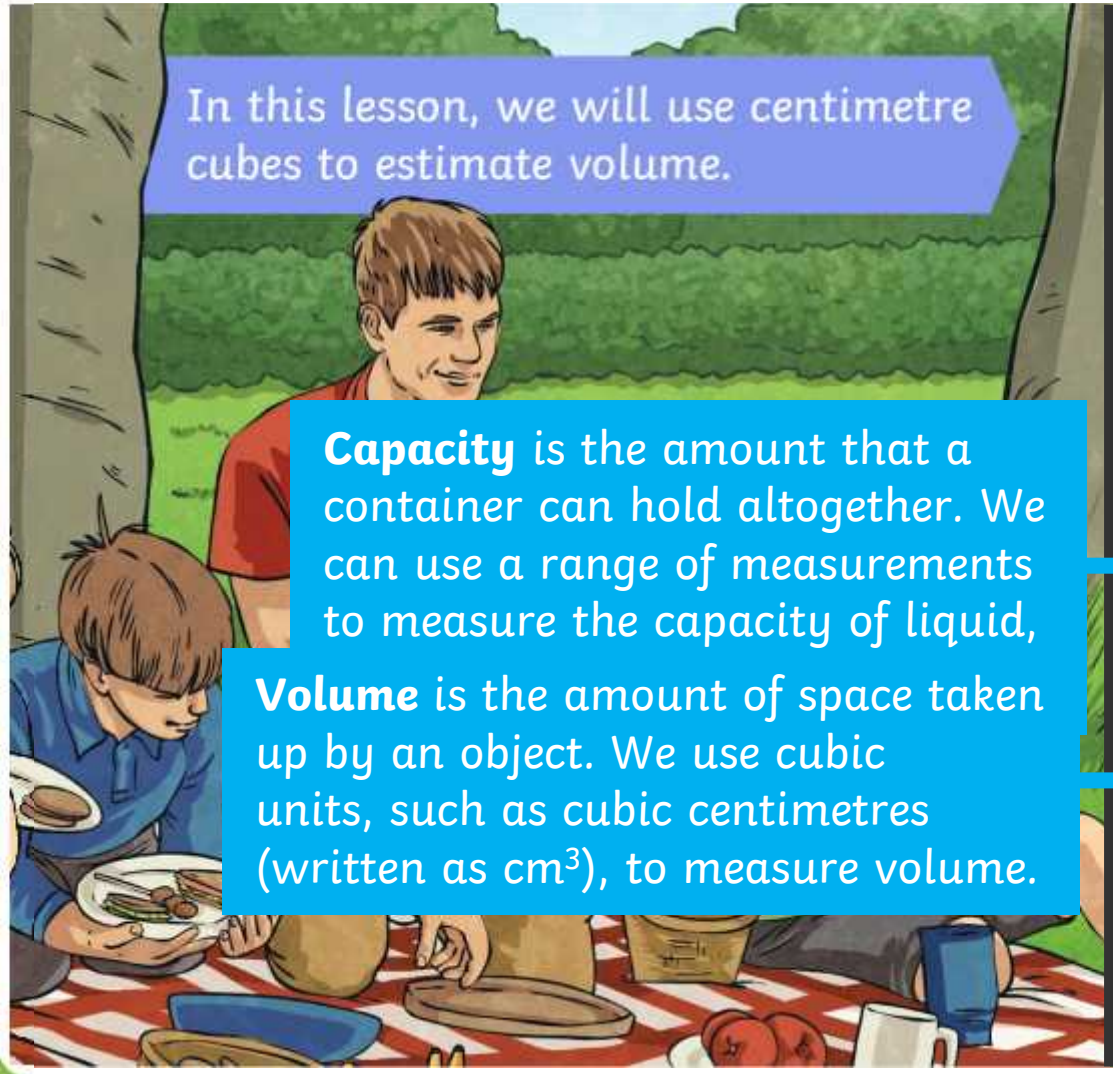


Yes!

4l ÷ 500ml
4000ml ÷ 500ml = **8**

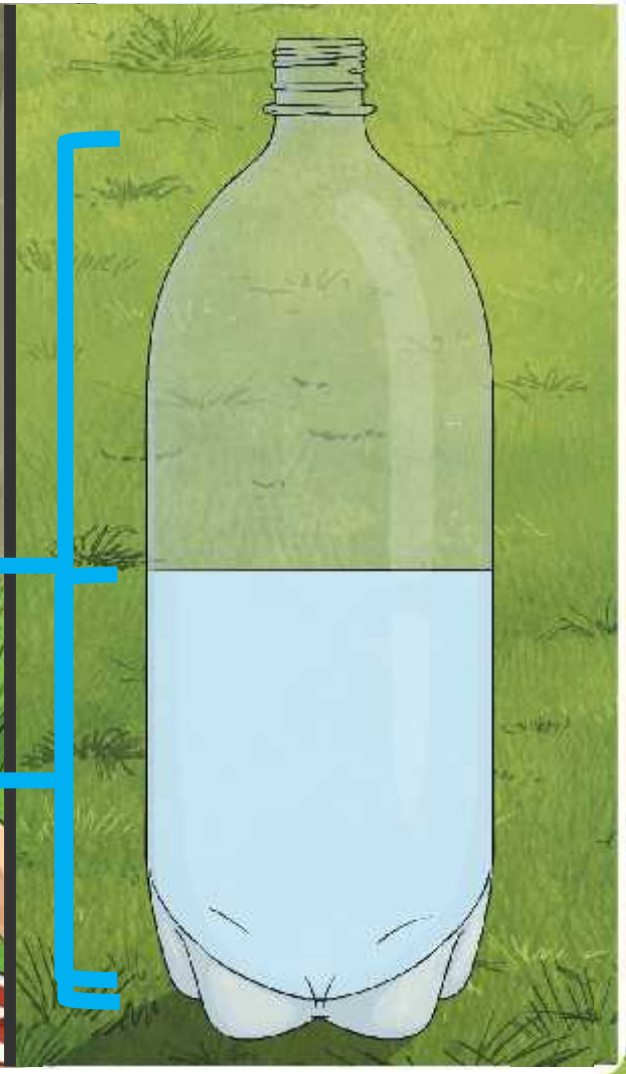
You would be able to use 8 full jars of water to fill the 4-litre bucket.

What Is Volume?

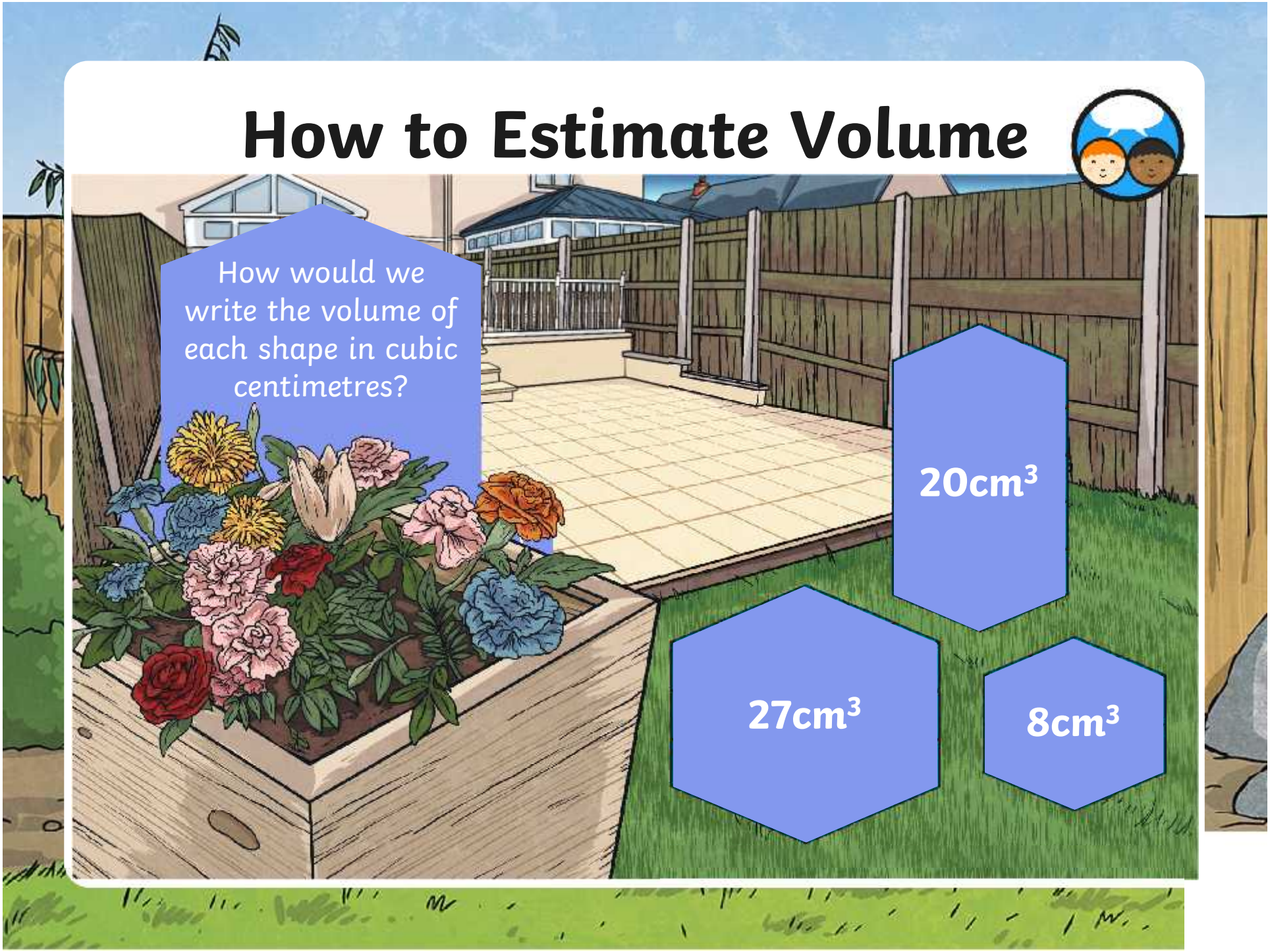


Capacity is the amount that a container can hold altogether. We can use a range of measurements to measure the capacity of liquid,

Volume is the amount of space taken up by an object. We use cubic units, such as cubic centimetres (written as cm^3), to measure volume.

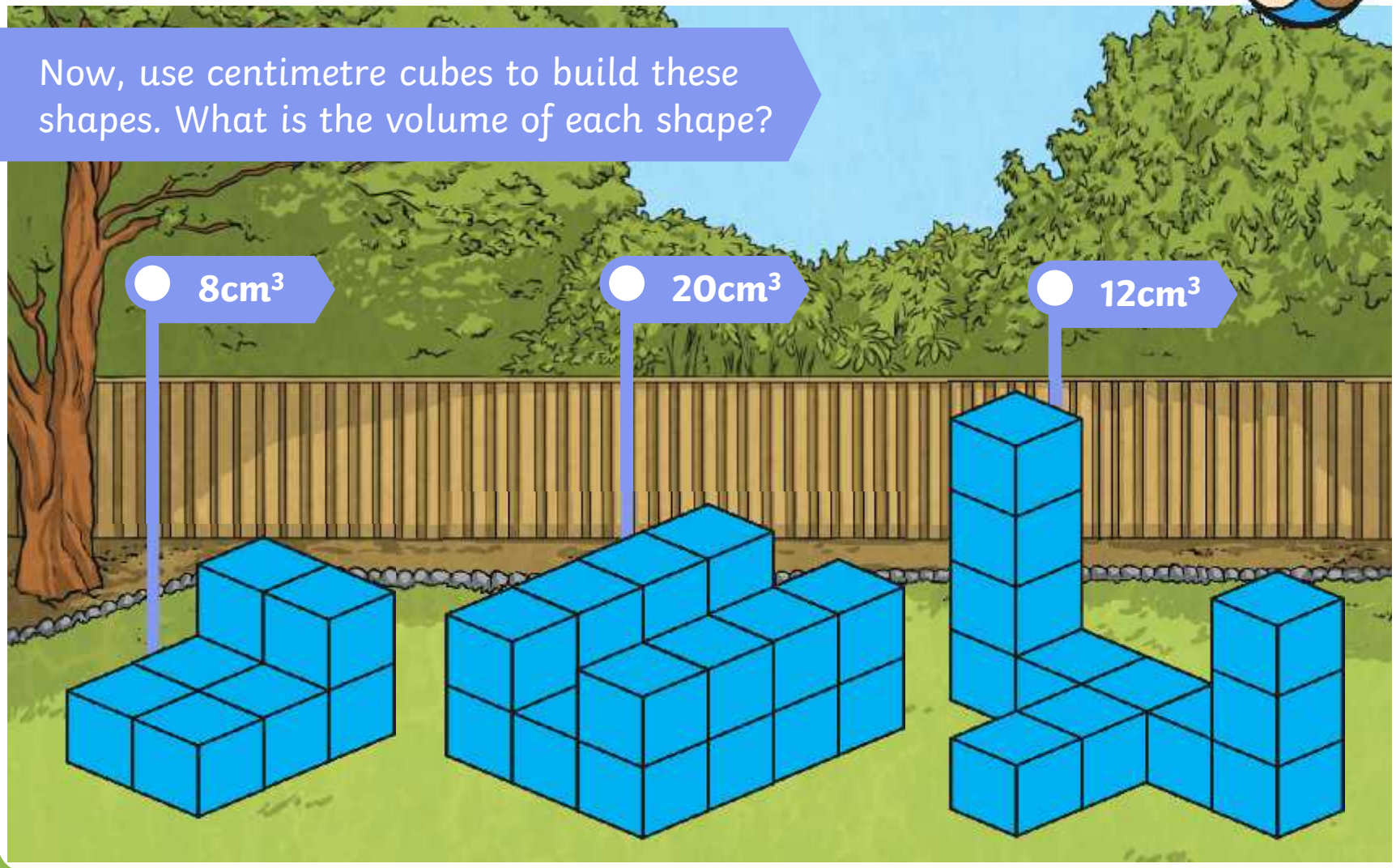


How to Estimate Volume



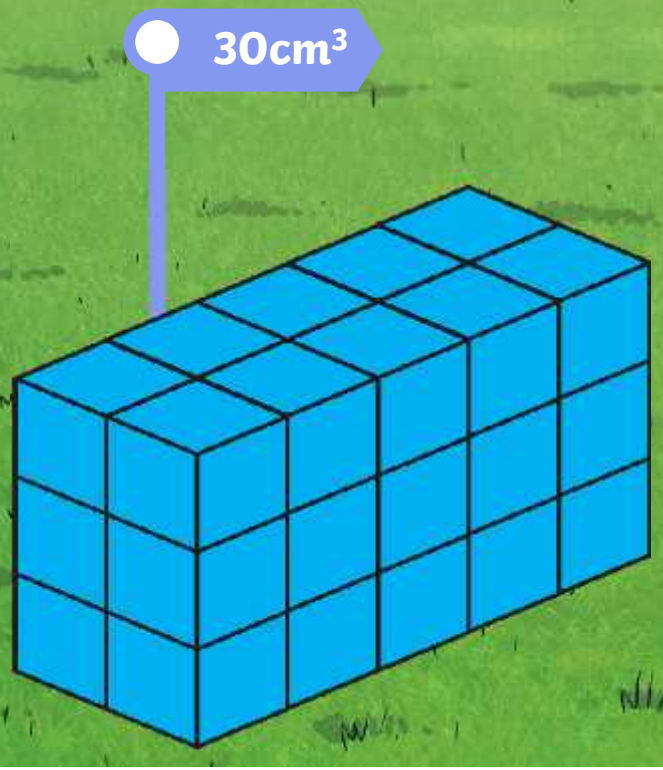
How to Estimate Volume

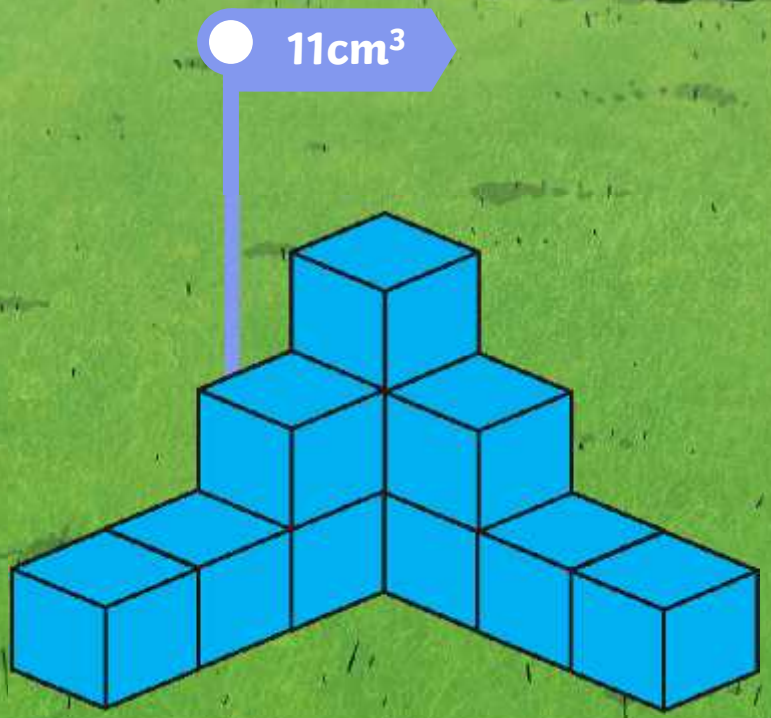
Now, use centimetre cubes to build these shapes. What is the volume of each shape?



How to Estimate Volume

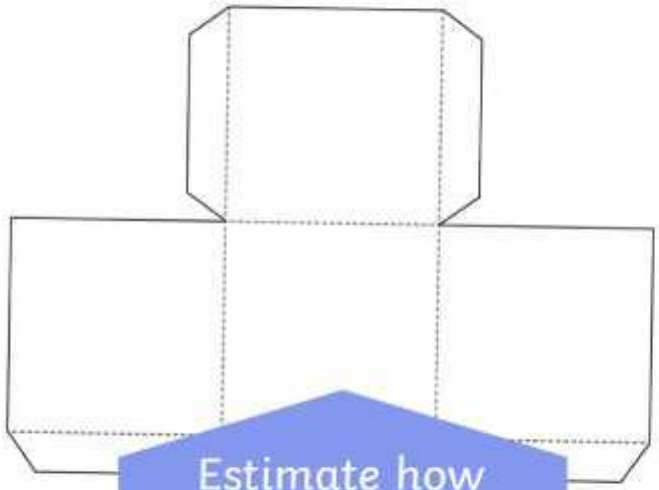
Can you count the cubes to estimate the volume of each shape without building it? Remember to count the cubes that you can't see.





Estimating Capacity

Open Top Cube Net



Estimate how many cm^3 cubes it would take to fill this container.

Use this to estimate the capacity in cm^3 of the larger cube.

Cut out the **Open Top Cube Net** and glue it together to form a cube (without a top). Fill it with one layer of cm^3 cubes. How many cm^3 cubes are in one layer? How could you find out how many layers could fit in the large cube?

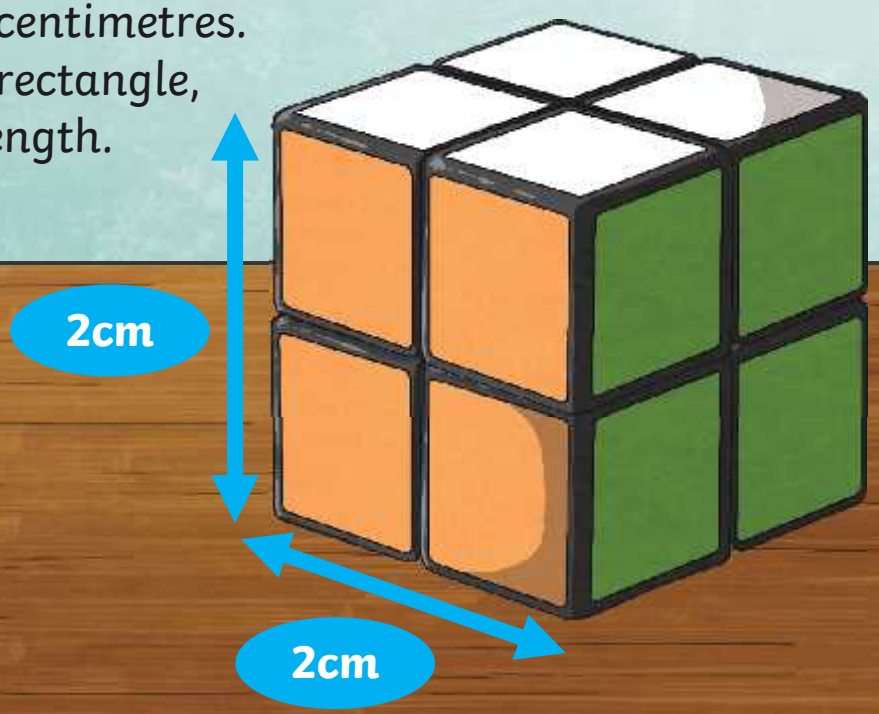
Calculating and Estimating Volume

To find the volume of any cuboid, we must first find the area of one of its faces.

Area is measured using square centimetres. To find the area of a square or rectangle, we multiply the width by the length.

2cm × 2cm = **4cm²**

Area of one face = **4cm²**

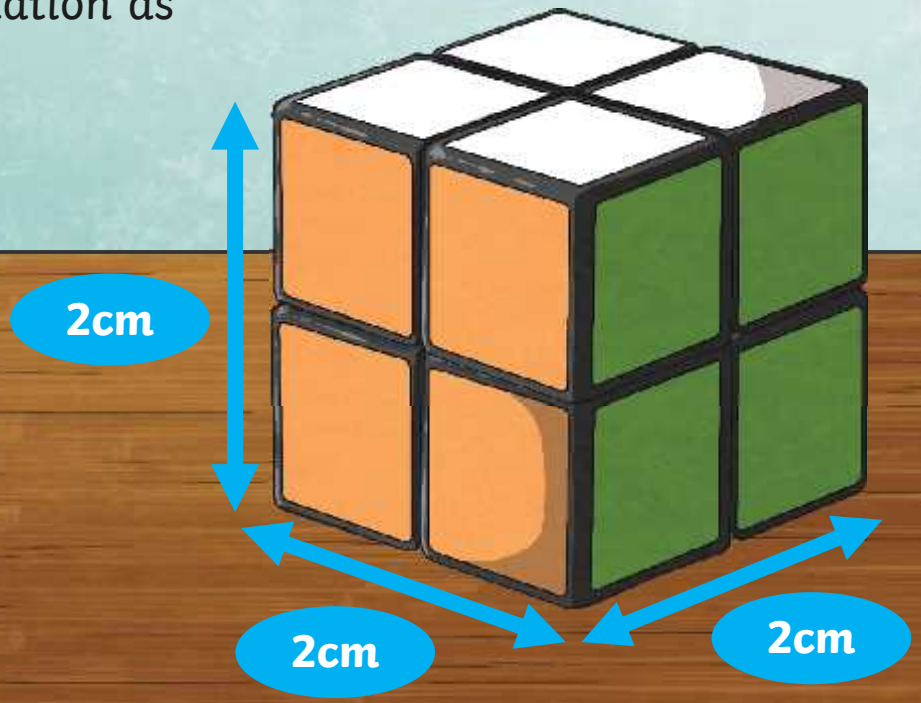


Calculating and Estimating Volume

To find the volume of a cuboid, we multiply the width by the length and then multiply this by the height.

Count the cubes to check.
Does the shape have a volume of 8cm^3?

We can write this volume calculation as
2cm × 2cm × 2cm = **8cm^3**



This is the same as finding the area of one face and multiplying it by the depth of the shape.

2 layers of 4cm^3 = **8cm^3**
or 2 × 4cm^3 = **8cm^3**

Calculating and Estimating Volume

Whole Class

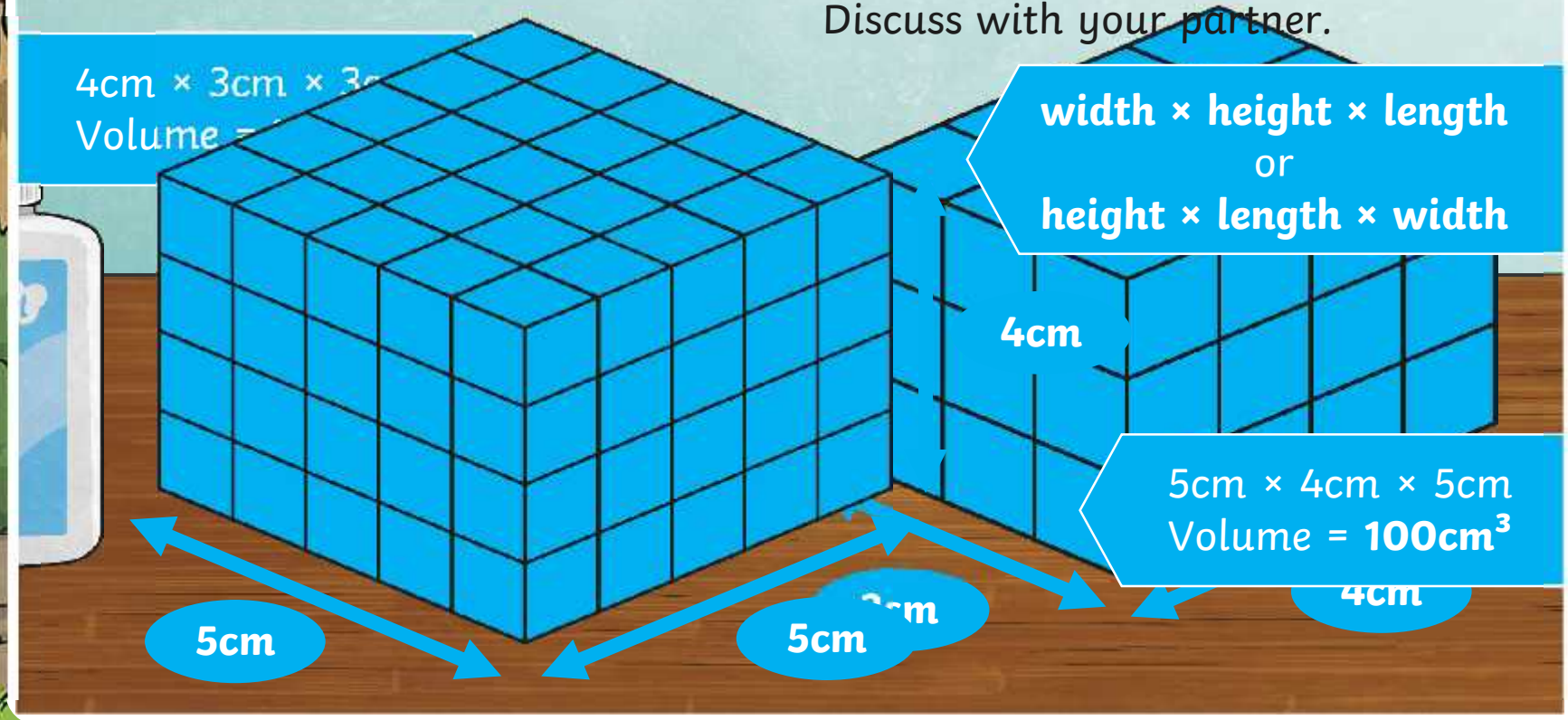
Use length × width × height to find the volumes of these shapes.

Does it change the answer if you multiply in a different order? Discuss with your partner.

4cm × 3cm × 3

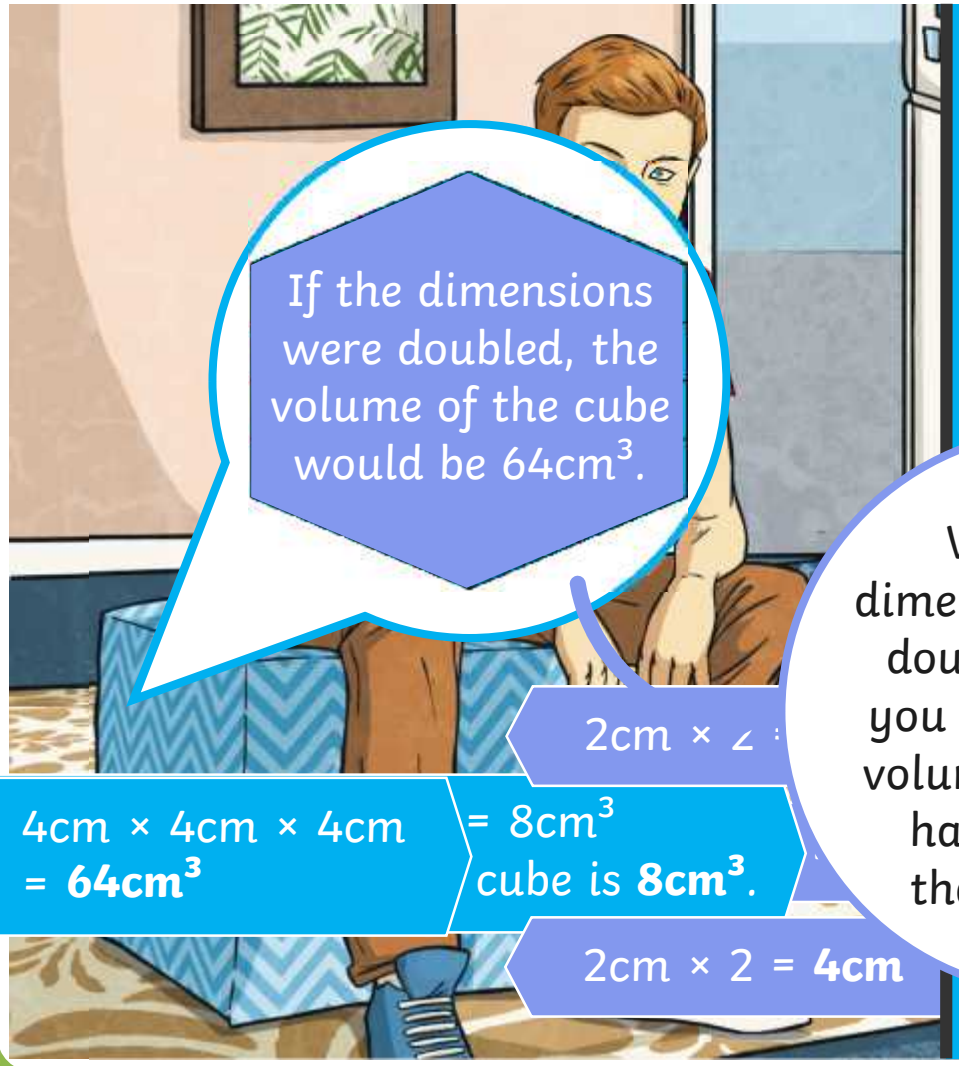
Volume =

width × height × length
or
height × length × width



5cm × 4cm × 5cm
Volume = **100cm³**

Volume Problems



If the dimensions were doubled, the volume of the cube would be 64cm³.

2cm × 2 = 4cm

4cm × 4cm × 4cm = **64cm³**

= 8cm³

cube is **8cm³**.

When each dimension has been doubled, why do you think that the volume of the cube has been more than doubled?

The **dimensions** of a shape refer to its measurements in a particular direction. In this case, we have measured the cube's length, width and height.

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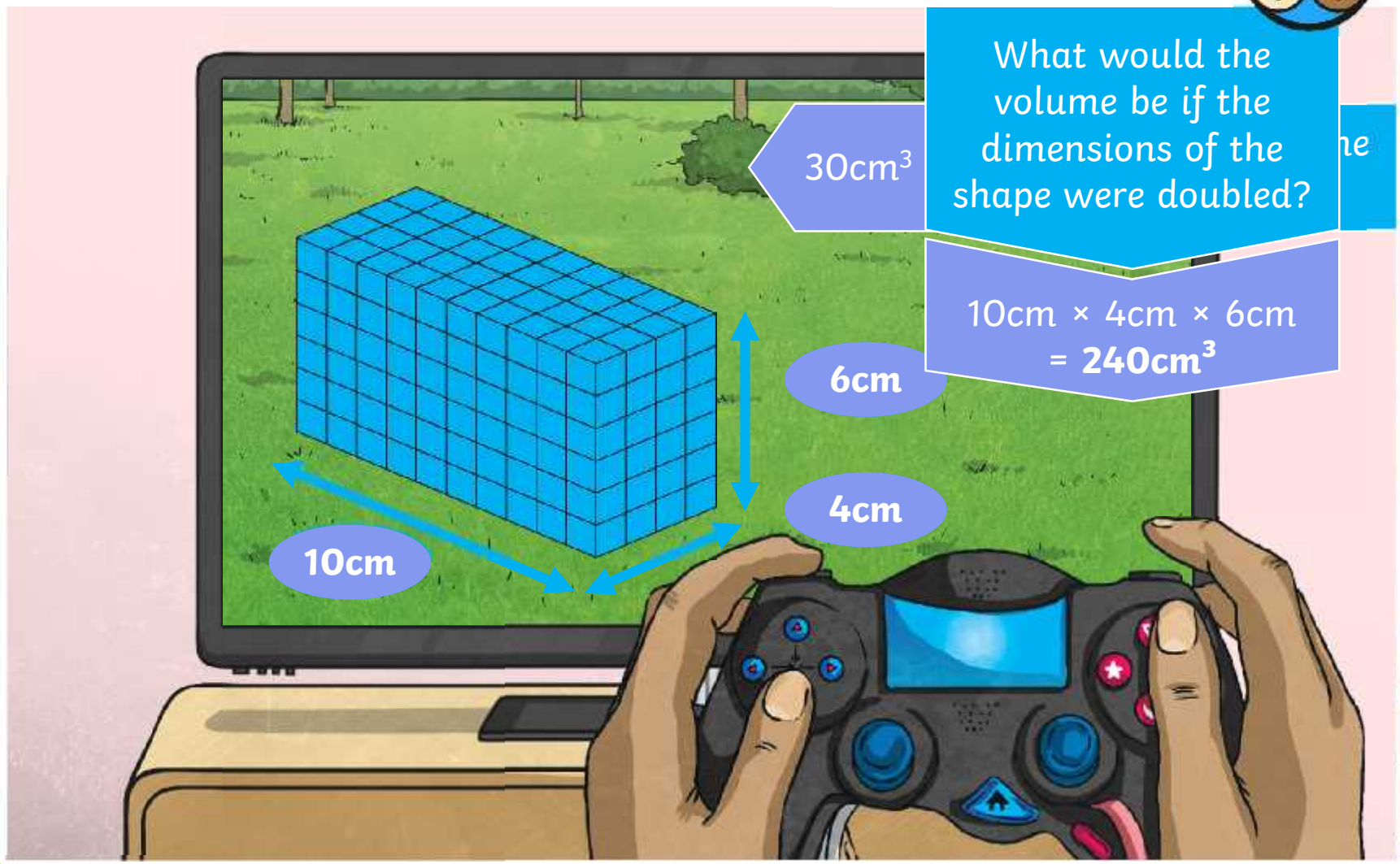
d, what do you
lume of the

the length?

e the width?

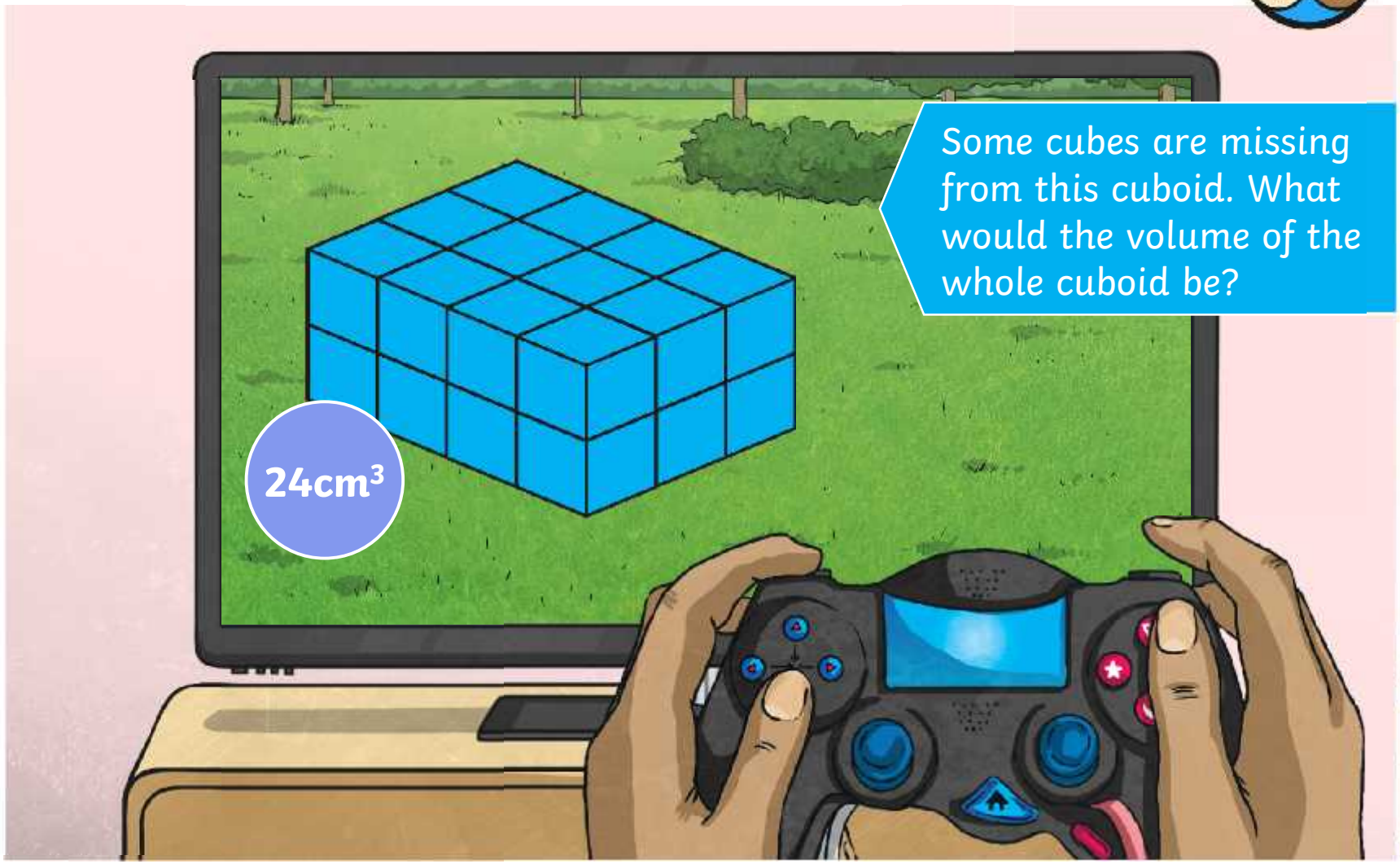
ould be the height?

Volume Problems

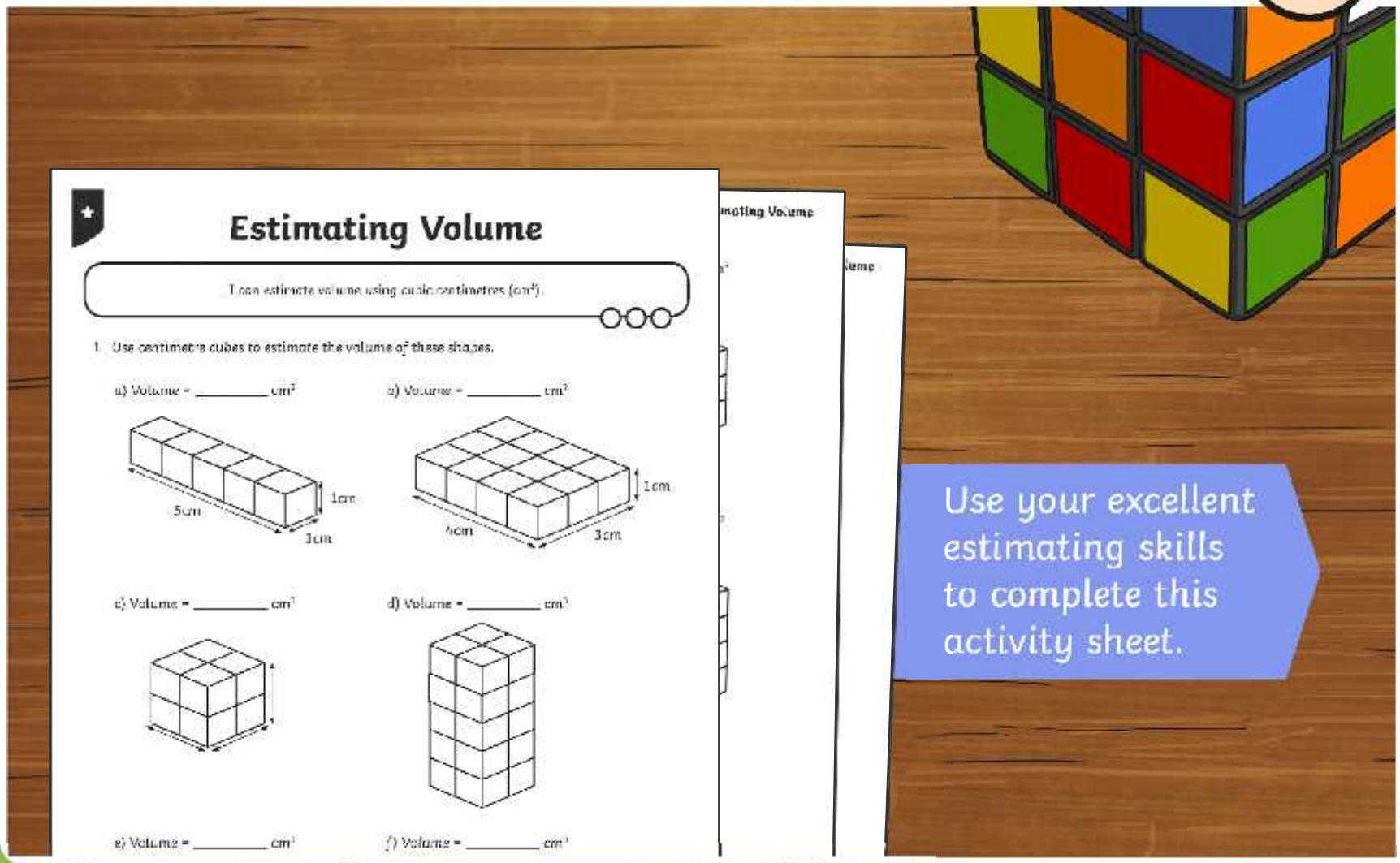


Volume Problems

Volume Problems



Estimating Volume

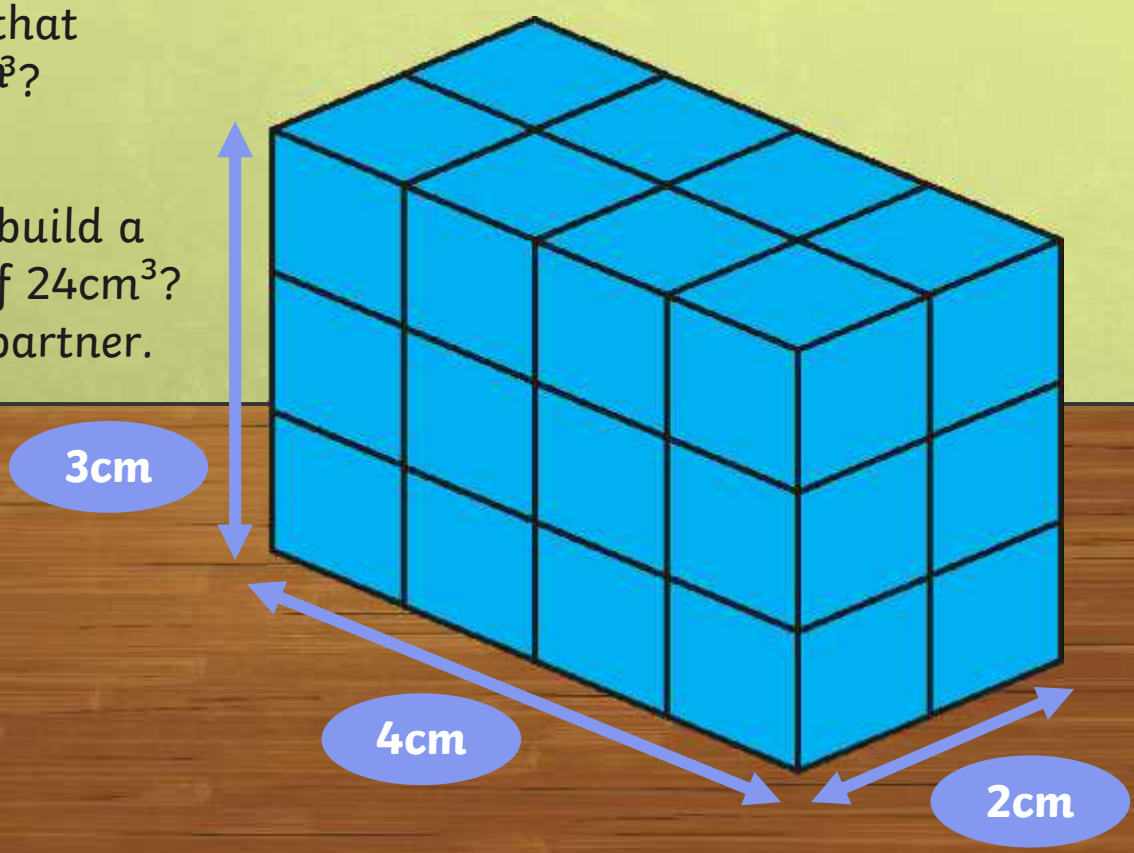


Volume 24

Using 24 centimetre cubes, how many different cuboids can you build that have a volume of 24cm^3?

How many cubes are on each layer?

Is this the only way to build a cuboid with a volume of 24cm^3? Discuss this with your partner.

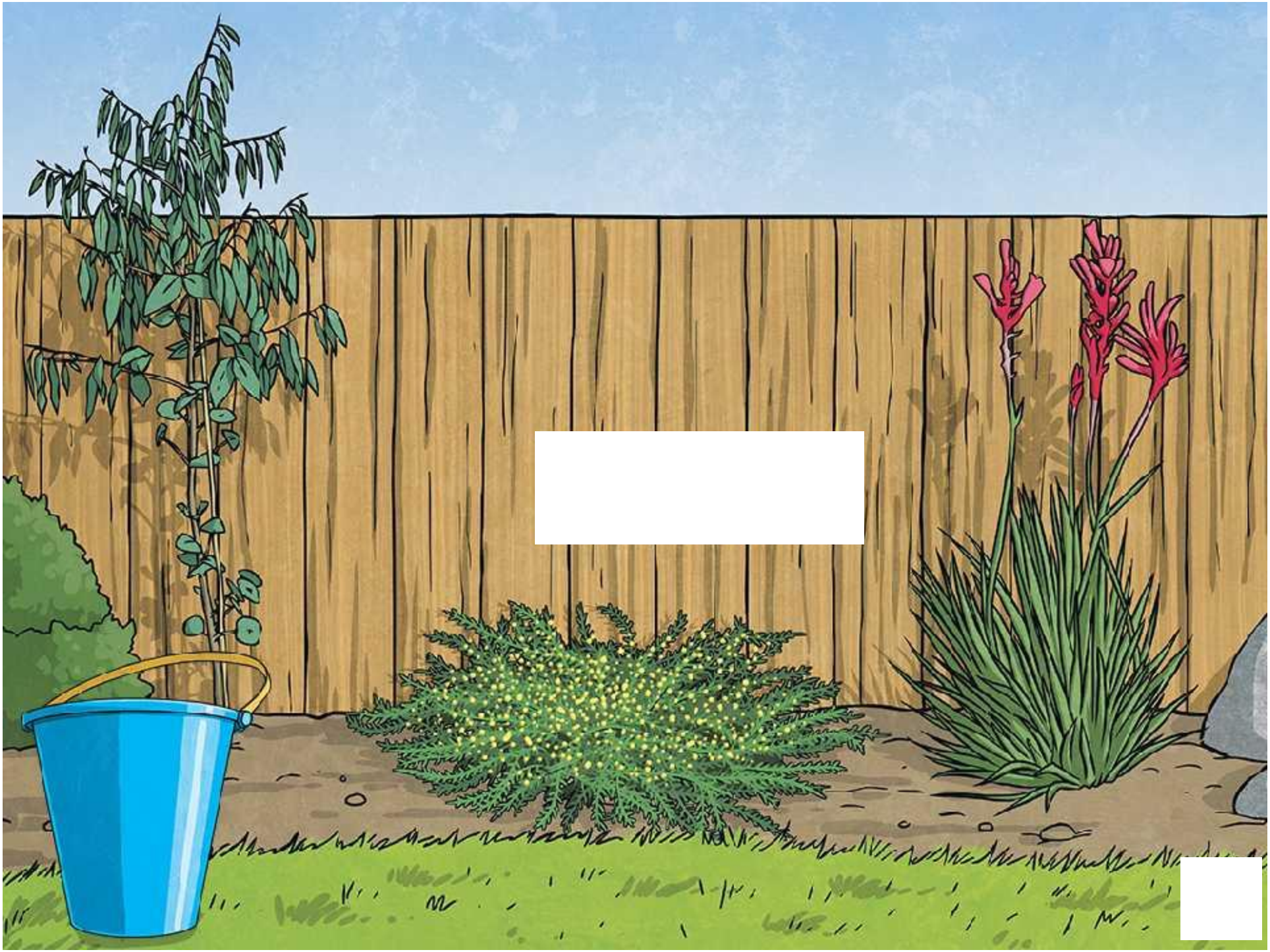


Aim

- I can estimate volume using cubic centimetres (cm^3).

Success Criteria

- I can explain what volume is and measure it in cm^3.
- I can estimate the number of centimetre cubes needed to build shapes.
- I can estimate the volume of cuboids in cm^3.



Aim: I can estimate volume using cubic centimetres (cm^3).				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can explain what volume is and measure it in cm^3.				**Notes/Evidence**					
I can estimate the number of centimetre cubes needed to build shapes.									
I can estimate the volume of cuboids in cm^3.									

Next Steps

- _____
- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
S	Supply	**GP**	Guided Practice

Aim: I can estimate volume using cubic centimetres (cm^3).				**Date:**					
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Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can explain what volume is and measure it in cm^3.				**Notes/Evidence**					
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Next Steps

- _____
- _____

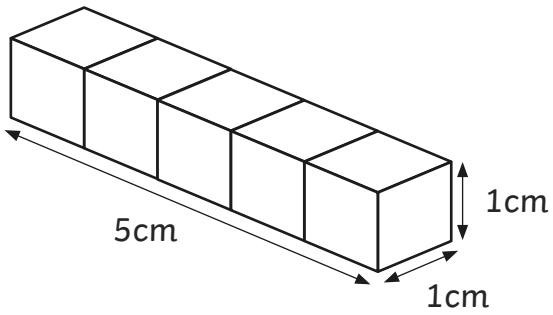
T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
S	Supply	**GP**	Guided Practice

Estimating Volume

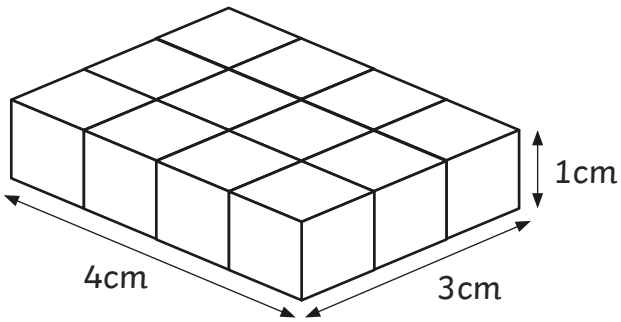
I can estimate volume using cubic centimetres (cm^3).

1. Use centimetre cubes to estimate the volume of these shapes.

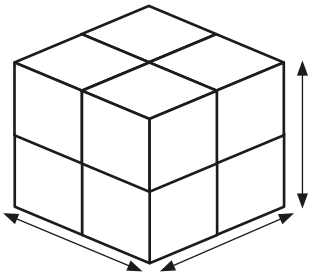
a) Volume = _____ cm^3



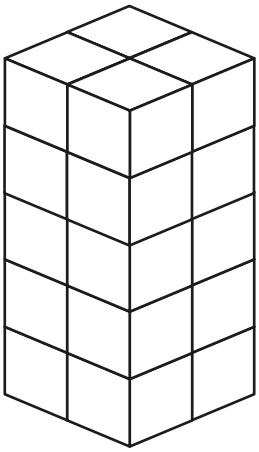
b) Volume = _____ cm^3



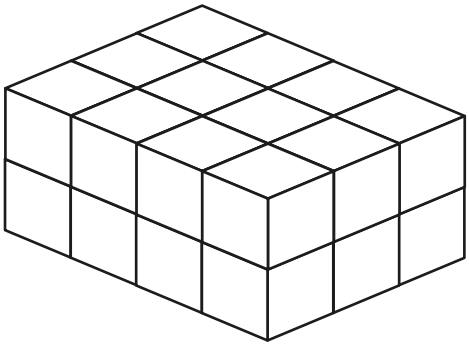
c) Volume = _____ cm^3



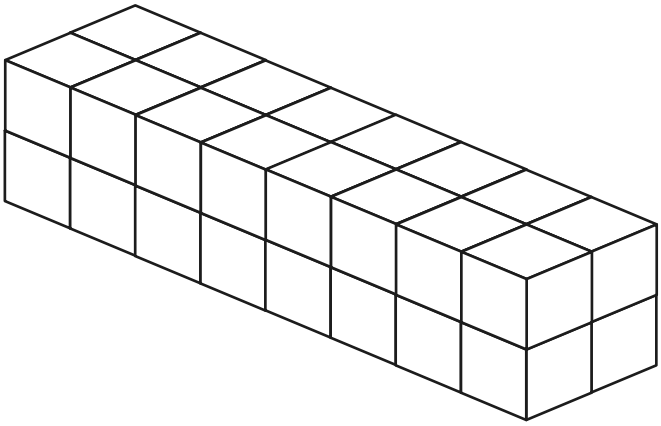
d) Volume = _____ cm^3



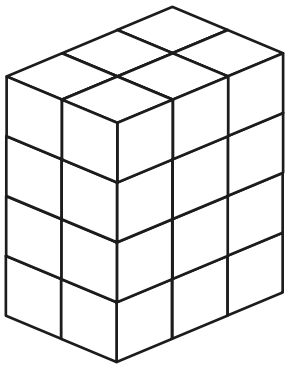
e) Volume = _____ cm^3



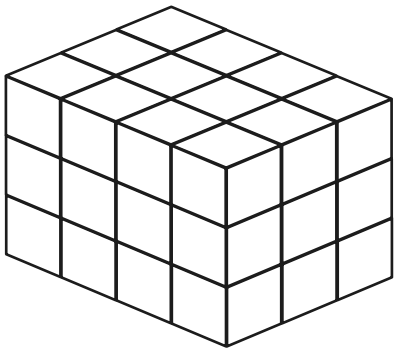
f) Volume = _____ cm^3



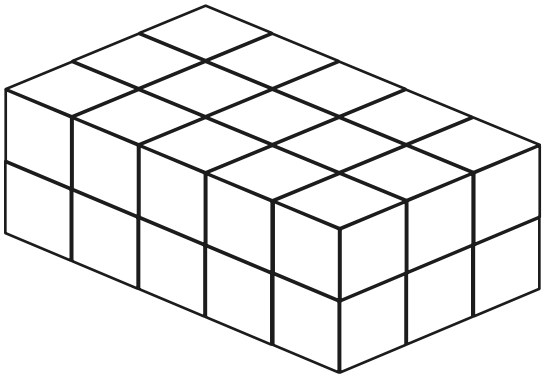
g) Volume = _____ cm^3



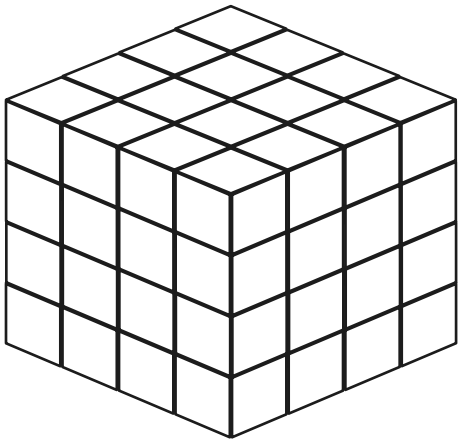
h) Volume = _____ cm^3



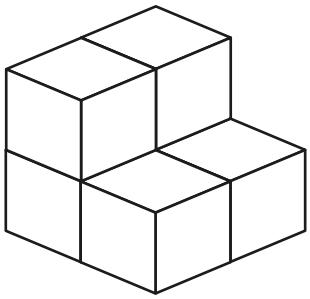
i) Volume = _____ cm^3



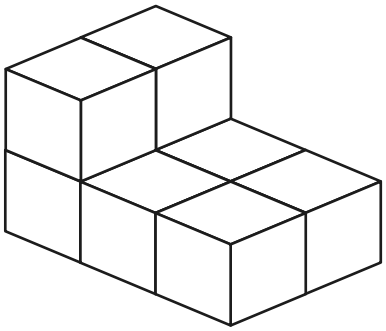
j) Volume = _____ cm^3



k) Volume = _____ cm^3

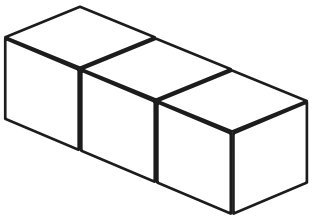


l) Volume = _____ cm^3



2.

Estimate the volume of this shape if each dimension were doubled.

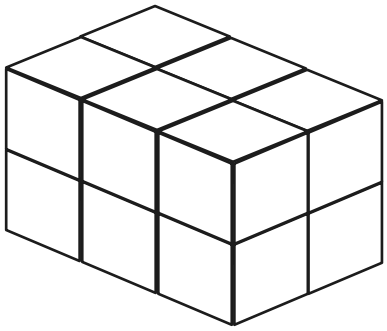


Estimated volume = _____ cm^3

Now use centimetre cubes to build the shape. What is the volume?

Volume = _____ cm^3

b. Estimate the volume of this shape if each dimension were doubled.



Estimated volume = _____ cm^3

Now use centimetre cubes to build the shape. What is the volume?

Volume = _____ cm^3

Estimating Volume **Answers**

1.

a) $5cm^3$

b) $12cm^3$

c) $8cm^3$

d) $20cm^3$

e) $24cm^3$

f) $32cm^3$

g) $24cm^3$

h) $36cm^3$

i) $30cm^3$

j) $64cm^3$

k) $6cm^3$

l) $8cm^3$

2.

a. Volume = $24cm^3$

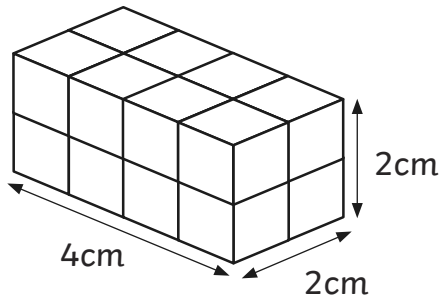
b. Volume = $96cm^3$

Estimating Volume

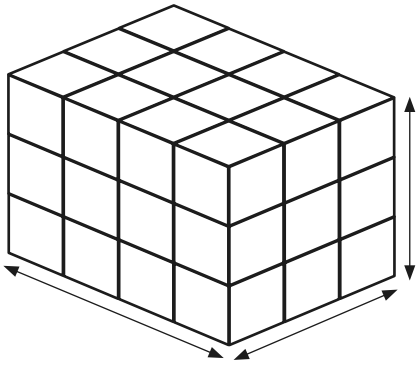
I can estimate volume using cubic centimetres (cm^3).

1. Estimate the volume of these shapes. You can use centimetre cubes to check your answer.

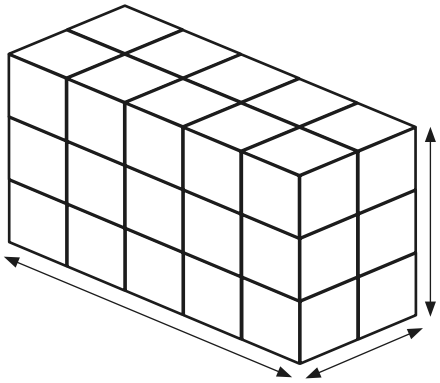
a) Volume = _____ cm^3



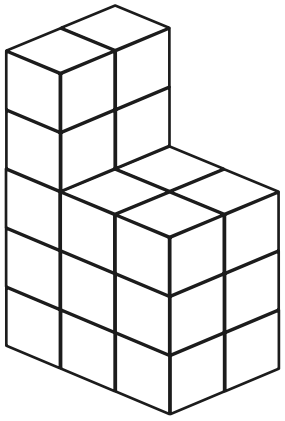
b) Volume = _____ cm^3



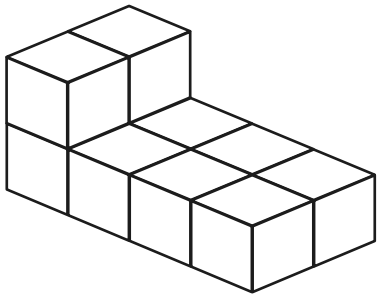
c) Volume = _____ cm^3



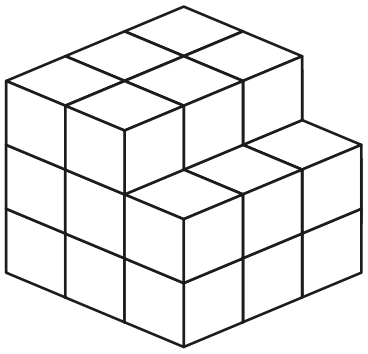
d) Volume = _____ cm^3



e) Volume = _____ cm^3

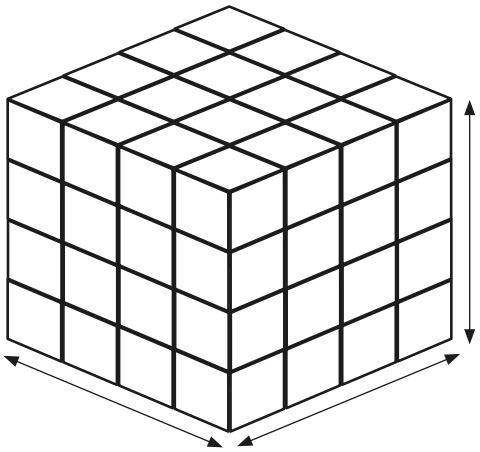


f) Volume = _____ cm^3

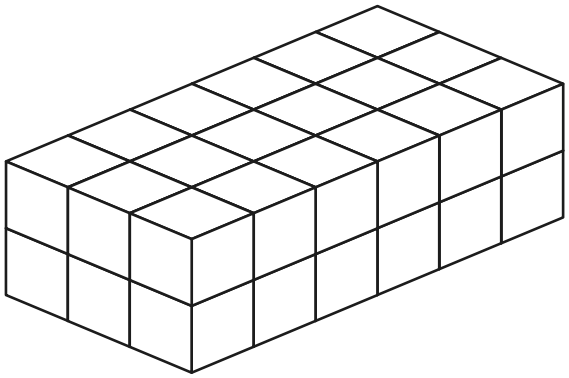


2. Calculate the volume of these shapes. Can you do this without using centimetre cubes?

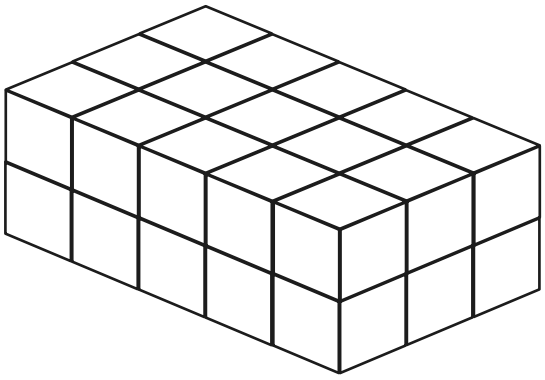
a) Volume = _____ cm^3



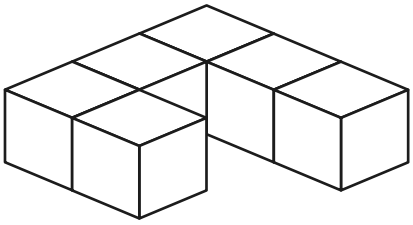
b) Volume = _____ cm^3



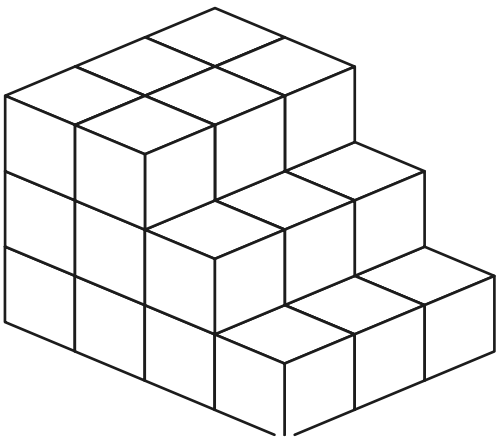
c) Volume = _____ cm^3



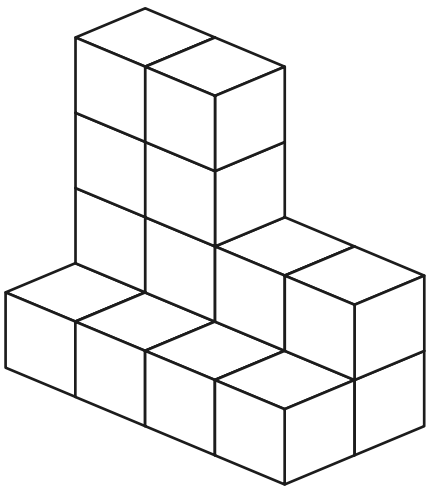
d) Volume = _____ cm^3



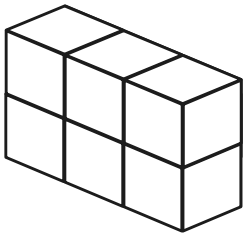
e) Volume = _____ cm^3



f) Volume = _____ cm^3



3. Estimate the volume of this shape if each dimension were doubled.

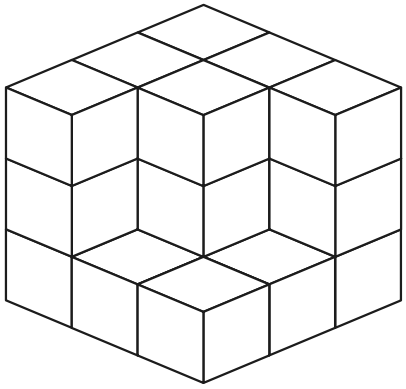


Estimated volume = _____ cm^3

Now use centimetre cubes to build the shape. What is the volume?

Volume = _____ cm^3

4. Some cubes are missing from this cube.



a. What are the fewest cubes possible that you could add to make this shape a cube? _____

b. What would the volume of the cube be?

Volume = _____ cm^3

You could use centimetre cubes to build the shape to check your answers.

Estimating Volume **Answers**

1.

a) $16cm^3$

b) $36cm^3$

c) $30cm^3$

d) $22cm^3$

e) $10cm^3$

f) $24cm^3$

2.

a) $64cm^3$

b) $36cm^3$

c) $30cm^3$

d) $6cm^3$

e) $27cm^3$

f) $16cm^3$

3. Volume = $240cm^3$

4.

a. 6

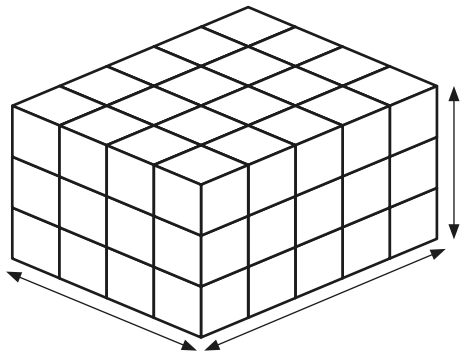
b. $27cm^3$

Estimating Volume

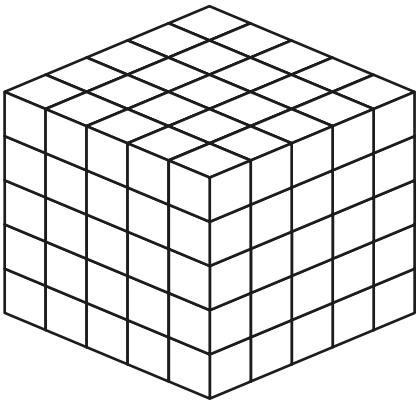
I can estimate volume using cubic centimetres (cm^3).

1. Calculate the volume of these shapes. Can you do it without using centimetre cubes?

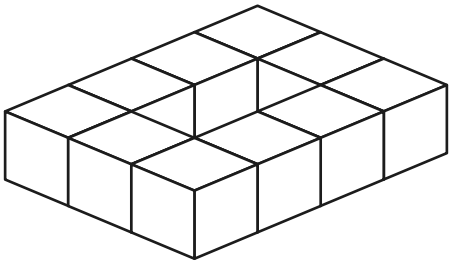
a) Volume = _____ cm^3



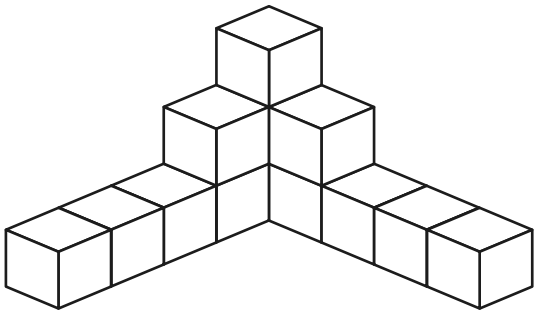
b) Volume = _____ cm^3



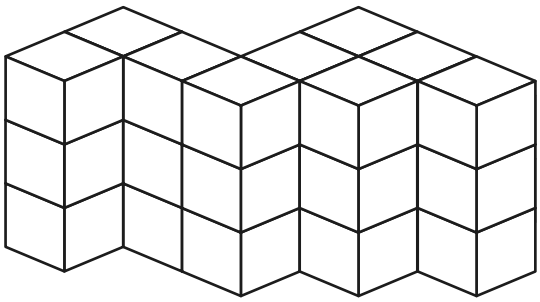
c) Volume = _____ cm^3



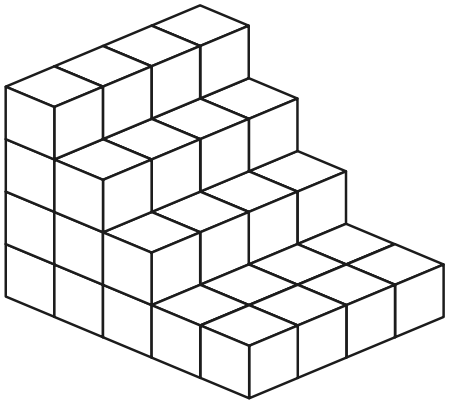
d) Volume = _____ cm^3



e) Volume = _____ cm^3

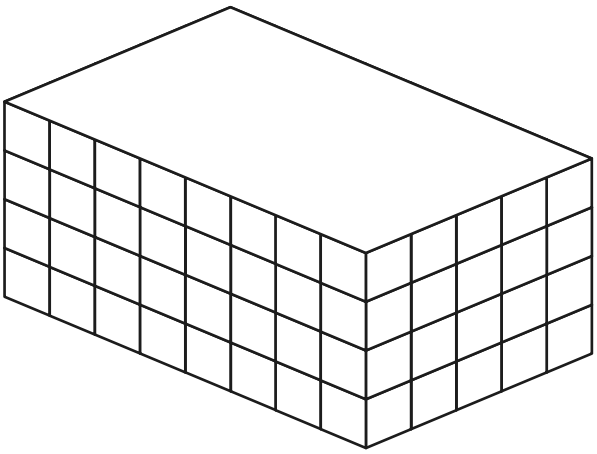


f) Volume = _____ cm^3

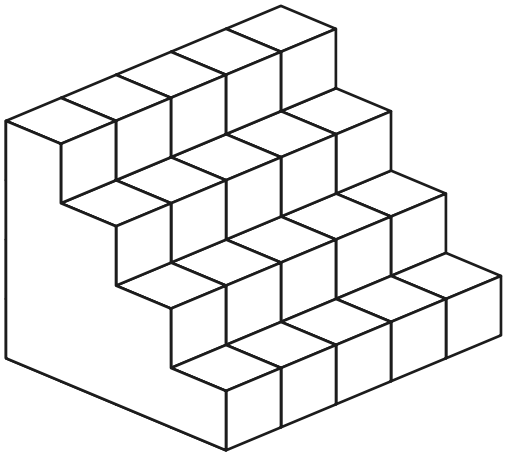


2. Not all of the centimetre cubes have been shown on these shapes. Calculate the volume of each shape.

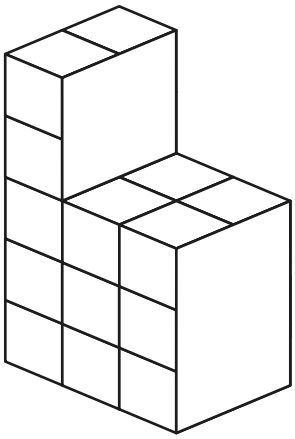
a) Volume = _____ cm^3



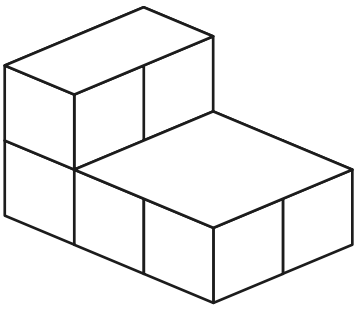
b) Volume = _____ cm^3



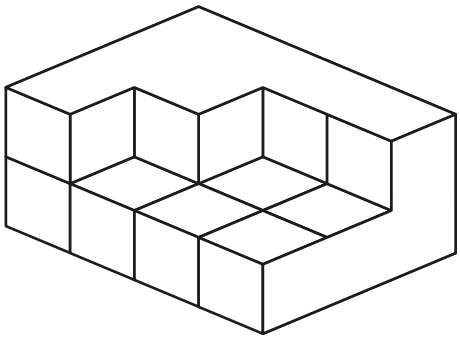
c) Volume = _____ cm^3



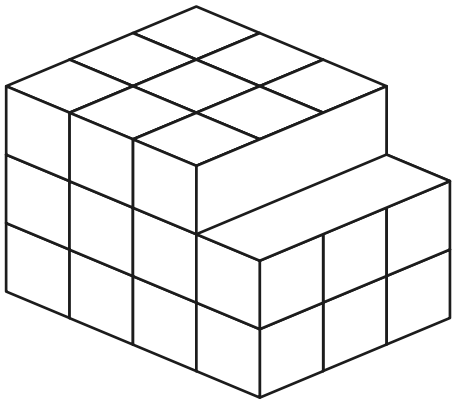
d) Volume = _____ cm^3



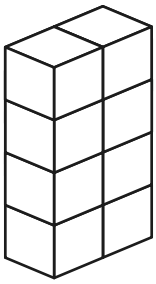
e) Volume = _____ cm^3



f) Volume = _____ cm^3



3. Estimate the volume of this shape if each dimension were doubled.

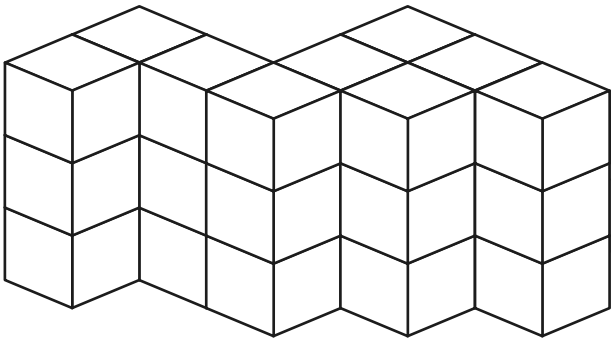


Estimated volume = _____ cm^3

Now use centimetre cubes to build the shape. What is the volume?

Volume = _____ cm^3

4. Some cubes are missing from this cuboid.



a. What are the fewest cubes possible that you could add to make this shape a cuboid? _____

b. What would the volume of the cuboid be?

Volume = _____ cm^3

Estimating Volume **Answers**

1.

a) $60cm^3$

b) $125cm^3$

c) $10cm^3$

d) $13cm^3$

e) $27cm^3$

f) $44cm^3$

2.

a) $160cm^3$

b) $50cm^3$

c) $22cm^3$

d) $8cm^3$

e) $19cm^3$

f) $33cm^3$

3. Volume = $64cm^3$

4.

a. 33

b. $60cm^3$

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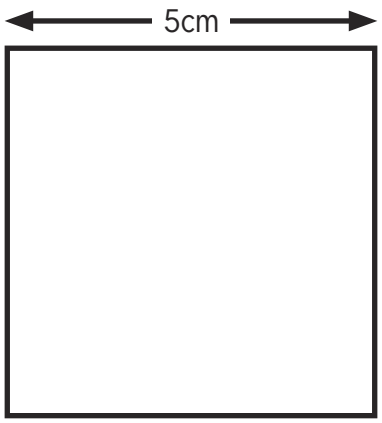

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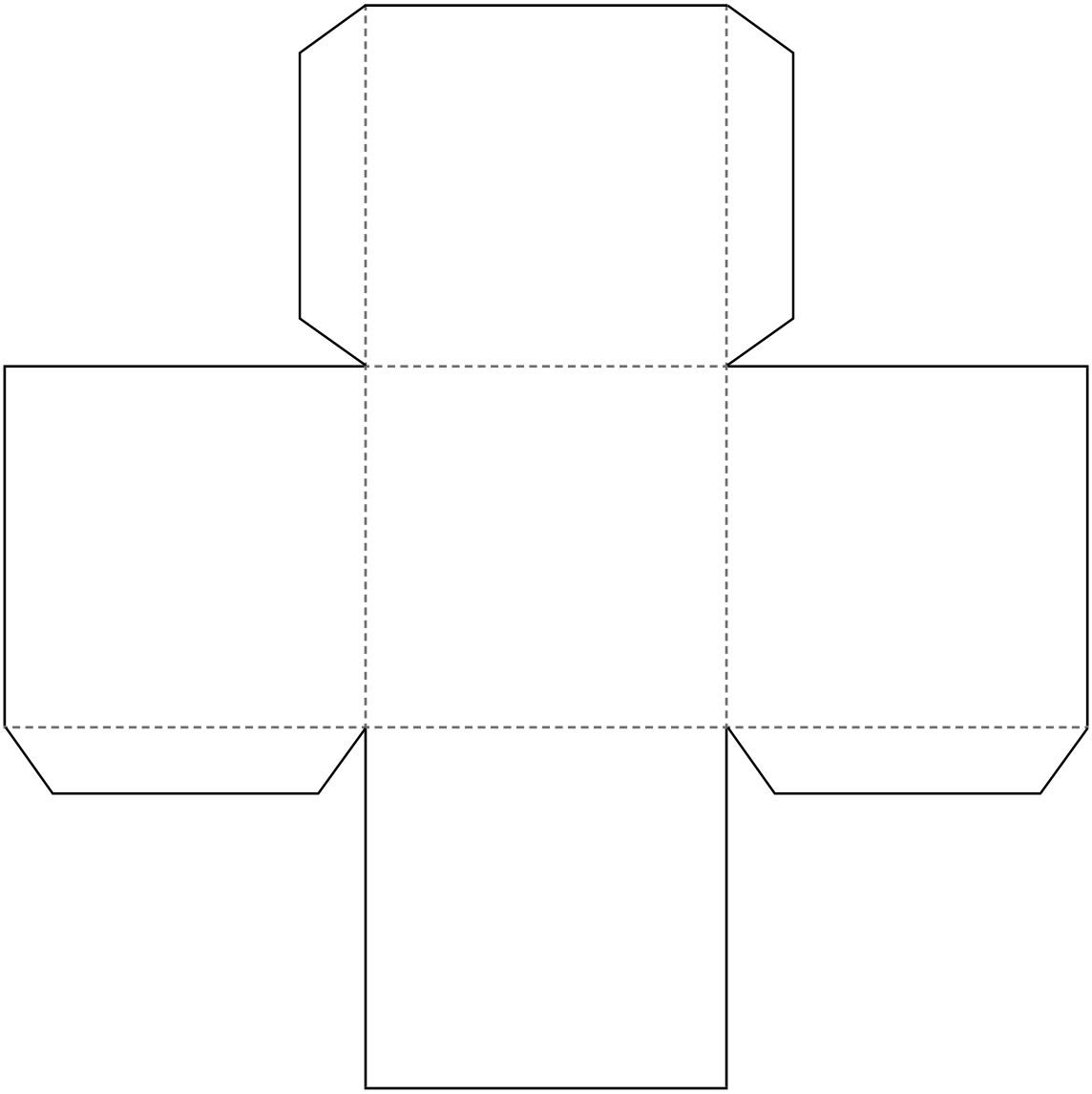

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Measurement | Estimating Volume

I can estimate volume using cubic centimetres (cm^3).		
I can explain what volume is and measure it in cm^3.		
I can estimate the number of centimetre cubes needed to build shapes.		
I can estimate the volume of cuboids in cm^3.		

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