White Rose Maths

Summer - Block 5

Volume

Overview

Small Steps

- What is volume?
- Compare volume
- Estimate volume
- Estimate capacity

Notes for 2020/21

Here children are reintroduced to the idea of volume but in a more formal way than they have seen previously.

What is Volume?

Notes and Guidance

Children understand that volume is the amount of solid space something takes up. They look at how volume is different to capacity, as capacity is related to the amount a container can hold.
Children could use centimetre cubes to make solid shapes. Through this, they recognise the conservation of volume by building different solids using the same amount of centimetre cubes.

Mathematical Talk

Does your shape always have 4 centimetre cubes? Do they take up the same amount of space?
How can this help us understand what volume is?

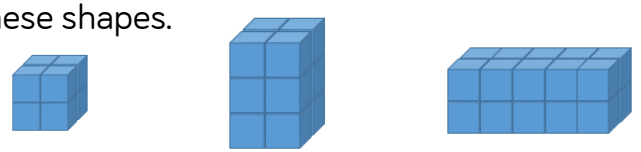
If the solid shapes are made up of 1 cm cubes, can you complete the table?
Look at shape A, B and C. What's the same and what's different?

How is capacity different to volume?

Varied Fluency

- Take 4 cubes of length 1 cm. How many different solids can you make? What's the same? What's different?

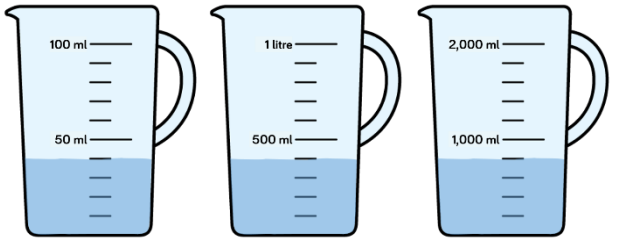
- Make these shapes.



Complete the table to describe your shapes.

Shape	Width (cm)	Height (cm)	Length (cm)	Volume (cm^3)
A				
B				
C				

- Compare the capacity and the volume. Use the sentence stems to help you.



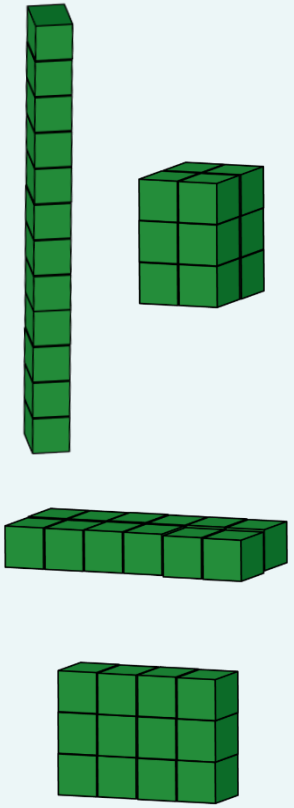
Container ___ has a capacity of ____ ml
The volume of water in container ___ is ___ cm^3

What is Volume?

Reasoning and Problem Solving

How many possible ways can you make a cuboid that has a volume of 12 cm^3?

Possible solutions:



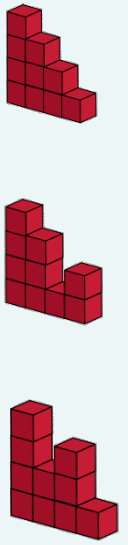
My shape is made up of 10 centimetre cubes.

The height and length are the same size.

What could my shape look like?

Create your own shape and write some clues for a partner.

Possible solutions include:



Compare Volume

Notes and Guidance

Children use their understanding of volume (the amount of solid space taken up by an object) to compare and order different solids that are made of cubes.

They develop their understanding of volume by building shapes made from centimetre cubes and directly comparing two or more shapes.

Mathematical Talk

What does volume mean?
What does cm^3 mean?

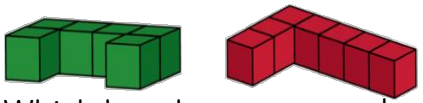
How can we find the volume of this shape?
Which shape has the greatest volume?
Which shape has the smallest volume?

Do we always have to count the cubes to find the volume?

Varied Fluency

- Work out the volume of each solid.

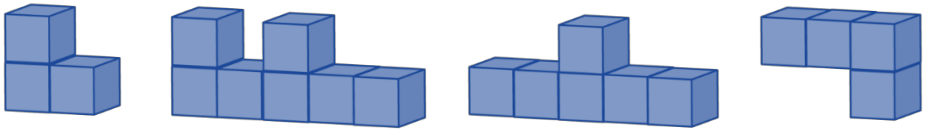
Shape A Shape B



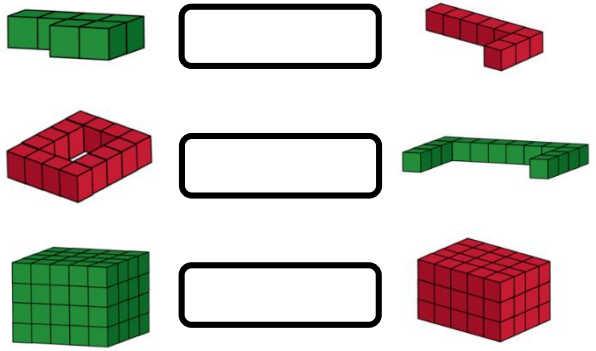
Shape A has a volume of ___ cm^3
Shape B has a volume of ___ cm^3

Which has the greatest volume?

- Look at the 4 solids below. Put the shapes in ascending order based on their volume.



- Count the cubes to find the volume of the shapes and use 'greater than', 'less than' or 'equal to' to make the statements correct.



Compare Volume

Reasoning and Problem Solving

Shape A has a height of 12 cm. Shape B has a height of 4 cm.
Dora says Shape A must have a greater volume.

Is she correct? Explain your answer.

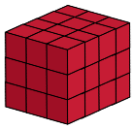
Dora is incorrect
e.g.
Shape A
12 cm × 1 cm × 2 cm = 24 cm^3

Shape B
4 cm × 9 cm × 2 cm = 72 cm^3

Amir, Whitney and Mo all build a shape using cubes.
Mo has lost his shape, but knows that it's volume was greater than Whitney's, but less than Amir's.

Amir's

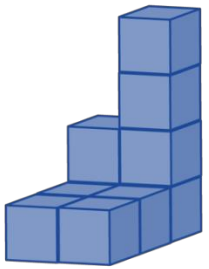
Whitney's



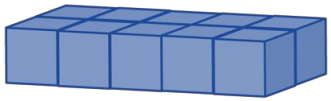
What could the volume of Mo's shape be?

The volume of Amir's shape is 56 cm^3
The volume of Whitney's shape is 36 cm^3
The volume of Mo's shape can be anywhere between.

Eva has built this solid:



Tommy has built this solid:



Eva thinks that her shape must have the greatest volume because it is taller.
Do you agree?
Explain your answer.

Eva is incorrect, both solids have an equal volume of 10 cm^3.
Children might want to build this to see it.

Estimate Volume

Notes and Guidance

Children estimate volume and capacity of different solids and objects.
They build cubes and cuboids to aid their estimates.
Children need to choose the most suitable unit of measure for different objects e.g. using m^3 for the volume of a room.
Children should understand that volume is the amount of solid space taken up by an object, whereas capacity is the amount a container can hold.

Mathematical Talk

What is the difference between volume and capacity?

Do you need to fill the whole box with cubes to estimate its volume?

Would unit to measure would you use to estimate the volume of the classroom?

Varied Fluency

- Estimate and match the object to the correct capacity.

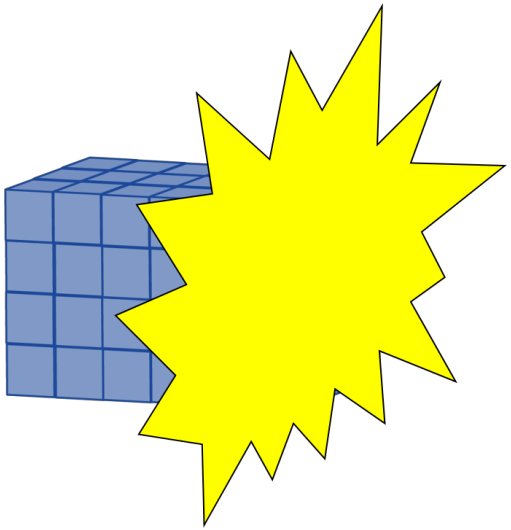
3,600 cm^3	1,000 cm^3	187,500 cm^3

- Use a box or drawer from your classroom.
Use cubes to estimate the volume of the box or drawer when it is full.

- Estimate then work out the capacity of your classroom.

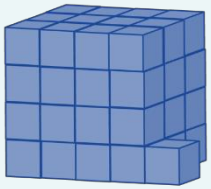
Estimate Volume

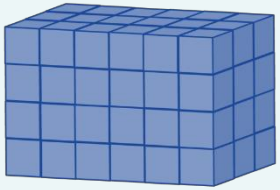
Reasoning and Problem Solving



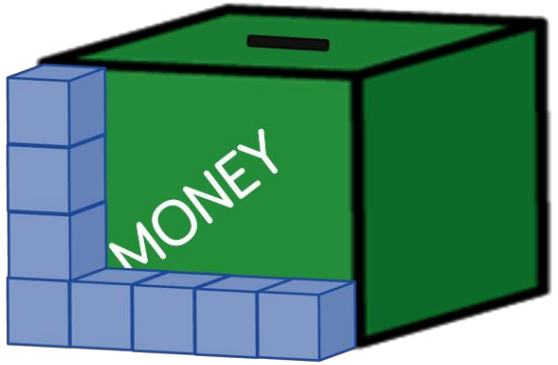
Each of the cubes have a volume of 1 m^3
The volume of the whole shape is between 64 m^3 and 96 m^3
What could the shape look like?

Any variation of cubes drawn between the following:





Jack is using cubes to estimate the volume of his money box.



He says the volume will be 20 cm^3

Do you agree with Jack?
Explain your answer.

What would the approximate volume of the money box be?

Jack is incorrect because he has not taken into account the depth of the money box.

The approximate volume would be 80 cm^3

Estimate Capacity

Notes and Guidance

Children estimate capacity using practical equipment such as water and rice.

Children explore how containers can be different shapes but still hold the same capacity.

Children will understand that we often use the word capacity when referring to liquid, rather than volume.

Mathematical Talk

Can I fill the tumbler so it is ___ full?
Compare two tumblers, which tumbler has more/less volume? Do they have the same capacity?

Can we order the containers?

If I had ___ ml or litres, which container would I need and why?

How much rice/water is in this container? How do you know?

Varied Fluency

- Use five identical tumblers and some rice.
  - Fill a tumbler half full.
  - Fill a tumbler one quarter full.
  - Fill a tumbler three quarters full.
  - Fill a tumbler, leaving one third empty.
  - Fill a tumbler that has more than the first but less than the third, what fraction could be filled?

- Show children 5 different containers.
  Which containers has the largest/smallest capacity?
  Can we order the containers?
  If I had ___ ml/l, which container would I need and why?
  Fill each container with rice/water and estimate then measure how much each holds.

- Match the containers to their estimated capacity.



5,000 ml	500 ml	5 ml

Use this to help you compare other containers. Use 'more' and 'less' to help you.

Estimate Capacity

Reasoning and Problem Solving

Give children a container. Using rice, water and cotton wool balls, can children estimate how much of each they will need to fill it? Discuss what is the same and what is different. Will everyone have the same amount of cotton wool? Will everyone have the same amount of rice? Will everyone have the same amount of water?	Possible response: Explore how cotton wool can be squashed and does not fill the space, whereas water and rice fill the container more.
Give children a container. Using rice/water and a different container e.g. cups, discuss how many cups of rice/water we will need to fill the containers. Link this to the capacity of the containers.	Various different answers.