

LO: To explore volume

What is volume?

<https://www.bbc.co.uk/bitesize/topics/zibg87h/articles/zcrxtyc>

Have a look at this web page to help you. There is a video, some text and a quiz to have a go at.

Volume

Volume is the amount of space a 3D shape takes up.

A cubic cm block takes up 1 cubic cm. This is written as 1 cm³.

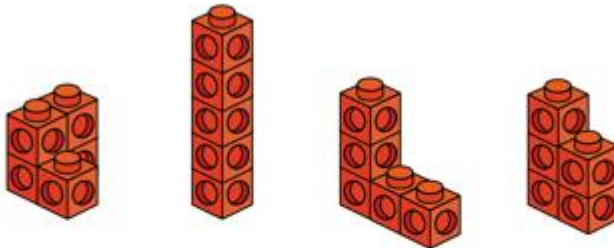
You can work out the volume of a shape by multiplying **height × width × depth**.

If the shape is made of cubic cm blocks, you can count the cubes to find the shape's volume.

When looking at volume, we will be using cubes to help us. If you have any cubes (like unifix) at home, these might help. Otherwise, this interactive website might be useful:

<https://toytheater.com/cube/>

Dexter has made some 3D shapes using cubes.



a) What is the same about the 3D shapes he has made?

b) What is different about the 3D shapes he has made?

What is the volume of each of Dexter's shapes? _____ Cubes

If each of these cubes was 1cm^3 , then each of these shapes will be 5cm^3 .

Now have a go at calculating the volume of these 3D shapes:

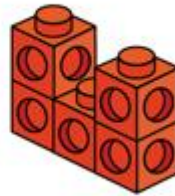
What is the volume of each 3D shape?

a)



volume = cubes

c)



volume = cubes

b)



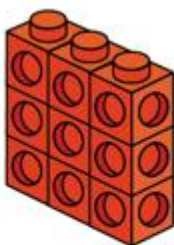
volume = cubes

d)



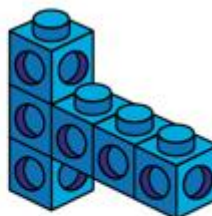
volume = cubes

e)



volume = cubes

f)

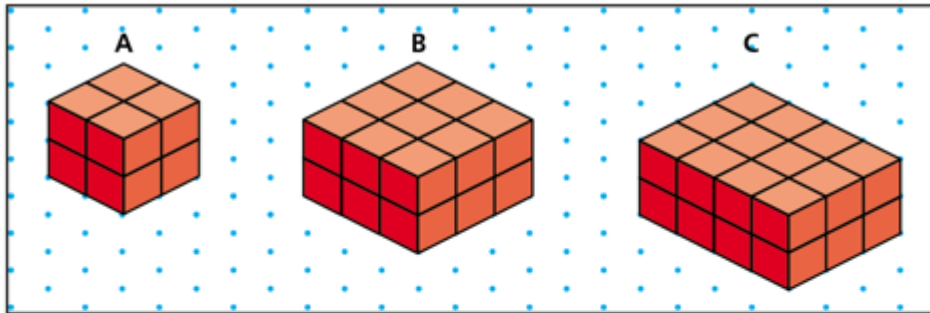


volume = cubes

You will notice that in all of these shapes, you can see all the cubes that make up the shape.

It is also important that you can visualise the number of cubes in shapes where all the cubes may not easily be visible.

Three cuboids are drawn on isometric paper.



a) How many cubes are needed to make each cuboid?

A cubes

B cubes

C cubes

b) If each cube has a side length of 1 cm, what is the volume of each cuboid?

A cm³

B cm³

C cm³

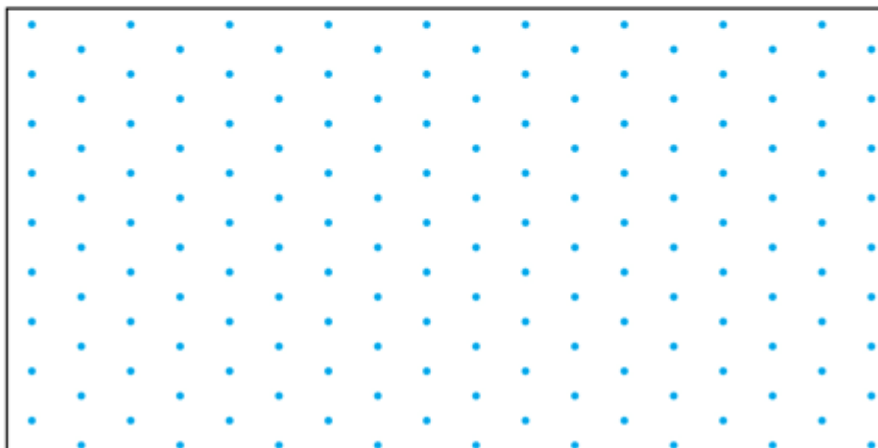
For your activity today, have a go at answering this question:

Ron is making 3D shapes using 10 cubes.



a) Use cubes to investigate the different shapes Ron can make.

b) Draw three of your shapes on the isometric paper.



What is the volume of each of your shapes?

There are various different answers, some ideas are given on the attached answer sheet. I have also enclosed some isometric dot paper to help you draw your responses if you have more ideas.

LO: To compare and estimate volumes

Today, you will be looking at some questions to help you compare and estimate volume.

Thinking back to yesterday:

Whitney and Tommy have each made a shape using cubes.

Each cube has a volume of 1 cm^3

Whitney



Tommy



a) What is the volume of Whitney's shape?

 cm^3

b) What is the volume of Tommy's shape?

 cm^3

c) Whitney and Tommy are comparing the volumes of their shapes.



Whitney

My shape has a greater volume because it is taller.



Tommy

My shape has a greater volume because I used more cubes.

Who do you agree with? _____

Explain your answer.

Remember that to calculate volume, we can count the number of cubes in each 3d shape.

Now have a go at these comparison questions. Remember that in some of the shapes, you will need to imagine the hidden cubes.

Each cube has a volume of 1 cm^3

What is the volume of each shape?

a)

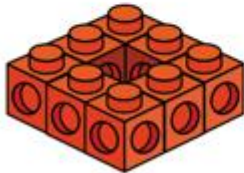


volume = cm^3

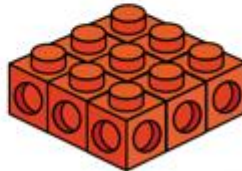


volume = cm^3

b)



volume = cm^3

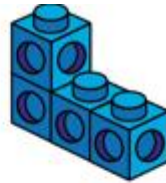


volume = cm^3

c)

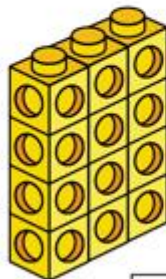


volume = cm^3

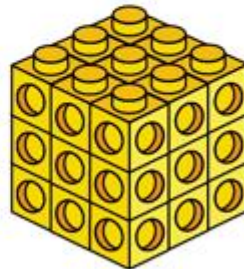


volume = cm^3

d)



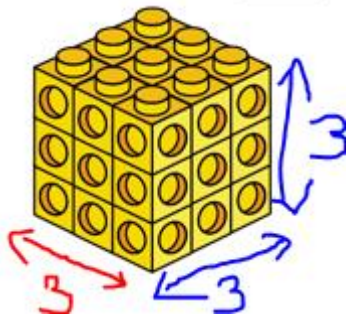
volume = cm^3



volume = cm^3

Tick the shape with the greater volume in each pair.

If we are looking at the last shape at the bottom (the yellow cube), we can think about how many cubes on one surface, then calculate it by the number of rows of that or:



On one of the faces there are 3 cubes by 3 cubes or

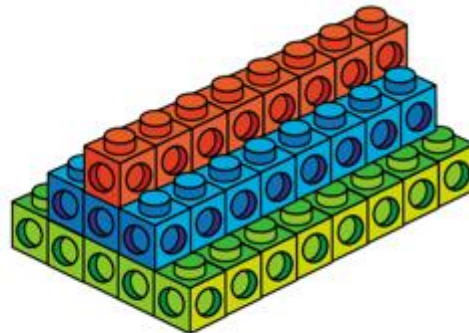
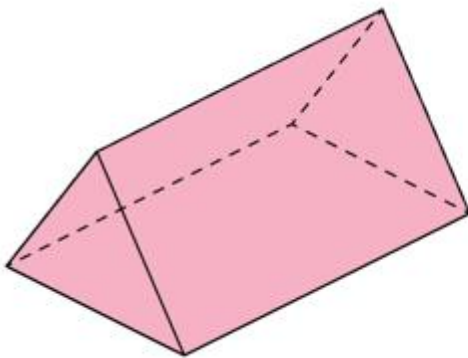
$$3 \times 3 = 9$$

This is then repeated 3 times so

$$9 \times 3 = 27$$

So this shape has a volume of 27cm^3 .

We can also use cubes to help estimate the volume of a shape:



Look at how the cubes are stacked.

Why might this be a good idea?

What is the volume of the shape on the right? (with the cubes)

Remember, you could do a multiplication to help. (What is the area of the front surface? How many layers of this are there?)

Or, you could calculate how many green, blue and red cubes and add these answers together.

Your answer represents the estimate of the volume of the shape on the left. (Can you remember what shape it is?)

Have a look at these images to decide on the best way to stack the cubes to estimate the volume of each shape. When you have chosen the best representation, see if you can make an estimate of the volume by counting/calculating the volume of the shape with cubes.

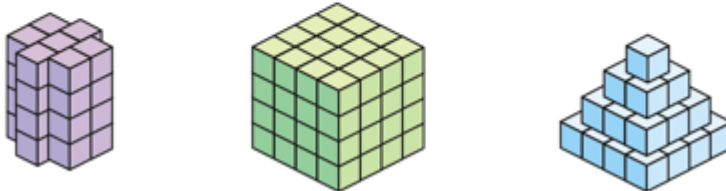
Here are some 3D shapes.



Rosie uses cubes to estimate the volume of each shape.

Each cube has a volume of 1 cm^3

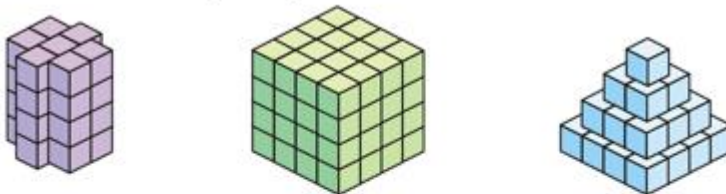
a) Tick the representation that will give Rosie the best estimate for the volume of the cube.



Estimate the volume of the cube.

cm^3

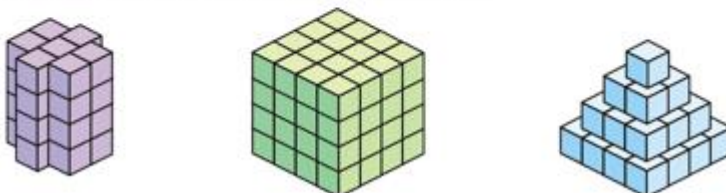
b) Tick the representation that will give Rosie the best estimate for the volume of the hexagonal prism.



Estimate the volume of the hexagonal prism.

cm^3

c) Tick the representation that will give Rosie the best estimate for the volume of the square based pyramid.



Estimate the volume of the square based pyramid.

cm^3

You can also use this information to help estimate the volume of different objects around your house.

Eg A 6 egg box:



Think about the area of the top of the box (in cm) It is probably about 20cm X 10cm

$$20 \times 10 = 200$$

Then the box is about 5 cm high or

$$200 \times 5 = 1000\text{cm}^3$$

So the volume of the egg box $\approx 1000\text{cm}^3$

Have a look at these images and see if you can match them to their estimated volume:

Match the object to its approximate volume.



330 cm³

33,000 cm³

330,000 cm³

How did you decide?

Now have a go at the questions on the Lesson 2 Activity sheet

LO: To investigate capacity

What is capacity?

This is a term you may be more familiar with than you were with volume.

In Maths, we use the term capacity to describe the amount of liquid which fits into a container.

Capacity is the amount something can hold.

We can use capacity to describe when something is **full**, **half full** and **empty**.

Some of the activities we are going to do today will need empty containers and water. If it's a nice, sunny day having a go outside is ideal!

Find 5 identical tumblers/cups.

- Fill a tumbler half full
- Fill a tumbler a quarter full
- Fill a tumbler three quarters full
- Fill a tumbler, leaving one third empty
- Fill a tumbler with less than the first, but more than the third What fraction could you have filled it with?

Have a go at these questions:

Each glass contains 200 ml of juice.

Estimate the capacity of each glass.

a)



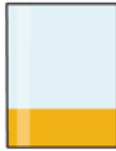
capacity = ml

c)



capacity = ml

b)



capacity = ml

d)



capacity = ml

Now, have a look in your kitchen cupboards for any items which contain liquids. What units are they measured in?

It might be millilitres, litres or centilitres, depending on the size of the container. Can you find 2 containers which contain the same capacity, but are different shapes?

Match the container to its approximate capacity.



250 ml

500 ml

1 litre

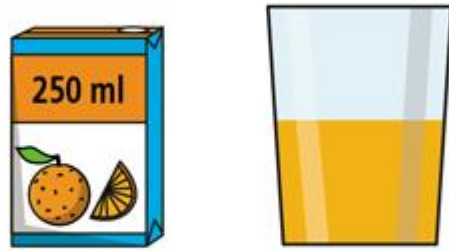
5 litres

10 litres

Have a go at these estimating questions:

Dora has a small carton of juice.

She pours the full carton of juice into a glass.



Estimate the capacity of the glass.

capacity = ml

Teddy has a bottle of water.

He pours the full bottle of water into a jug.



Estimate the capacity of the jug.

Give your answer in both millilitres and litres.

capacity = ml capacity = l

Dexter is filling a beaker with sand.



So far I
have poured five full
bags of sand into
the container.



Estimate the capacity of one of the bags.

capacity = ml

Lesson 3 Activity - Find some empty containers around your house. These could be any shape. You will also need a measuring jug to check the capacity.

Firstly, estimate the capacity of the item eg for an empty coffee mug, I might estimate 250ml (this will depend on the size of what you have found.) Complete the estimate column in the table. Then you need to fill the container with water and tip it into your empty measuring jug. Then, you can read the scale on your measuring jug to check your estimate.

I would expect you to get more accurate the more you try, as you will be able to compare the size/capacity of the container to your first few answers.

Complete this grid with your findings:

Container	Estimate	Actual
Coffee Cup	250ml	330ml

Be careful not to get too wet!!! 😊

E4E If you would like another capacity challenge or you are struggling to find empty containers and a measuring jug, this is a great investigation to look at:

<https://nrich.maths.org/13664>

The instructions for what you need to do are all on the web page and there is a tab on the top left-hand side which has some possible solutions which have been submitted by other pupils.

LO: To assess what I have learnt over the past few weeks

This week, I have attached some assessment documents for the work we have covered over the past few weeks on Position and Direction; Converting Units and Volume.

I would aim to spend the last couple of days before the holiday on these.

When you have answered them, you can check your answers. If there are areas which you are not sure about, have a look back at the last few weeks learning.

You could also search for lessons/activities on Oak National Academy (the online lesson area) for any extra practice if you think you need it.

I hope you have enjoyed your Math's learning over the last few weeks!