Summer Block 6

Volume

Small steps

Step 1	Cubic centimetres
Step 2	Compare volume
Step 3	Estimate volume
Step 4	Estimate capacity

Cubic centimetres

Notes and guidance

In Year 3, children compared volumes of liquids using words such as "empty", "full", "more" and "less". In this small step, they learn that volume refers to the amount of three-dimensional space an object takes up, and they measure volume using cubes.

Children make simple shapes with interlocking cubes and describe the volume of each shape in terms of the number of cubes. They then look at pictorial representations and work out how many cubes there are in each shape, including counting the cubes that cannot be seen in the picture. They then find the volume of a variety of shapes, using both concrete and pictorial representations, using the fact that each cube has a volume of one cubic centimetre (written 1 cm^3).

Finally, they make and measure the volumes of cuboids. Children recognise that some of the cubes in a pictorial representation cannot be seen, but that the total volume can be found by counting the number of cubes in each layer. This leads to the formula to work out the volume of a cuboid, which is covered in Year 6

Things to look out for

- Children may only count the visible cubes when working out the volume of a 3-D shape.
- Children may omit units from their answer.

Key questions

- What is volume?
- What unit can you use to measure volume?
- What is the difference between one square centimetre and one cubic centimetre?
- How many cubes is the shape made up of?
- What is the volume of the shape/cuboid?
- How can you make a cuboid that has 16 cubes?

  Is there more than one way?

Possible sentence stems

- The number of cubes needed to make the shape is _____
- The volume of the shape is _____ cubic centimetres.
- There are _____ cubes in each layer and there are _____ layers.
  There are _____ cubes altogether.

National Curriculum links

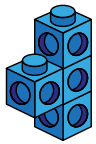
- Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity

Cubic centimetres

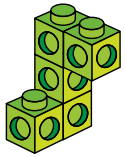
Key learning

- Jack and Kim are using cubes to make shapes.

Jack



Kim

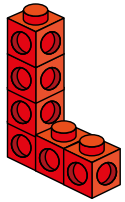


How many cubes have they each used?

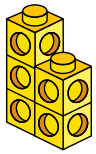
- Dora and Max have each made a shape using cubes.

The volume of each cube is 1 cm^3

Dora



Max

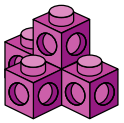


What is the volume of each of their shapes?

- Tommy uses cubes to make this 3-D shape.

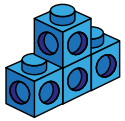
Each cube has a volume of 1 cm^3

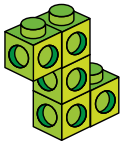
What is the volume of Tommy's shape?

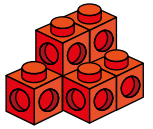


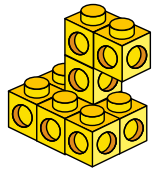
- What is the volume of each 3-D shape?

Each cube has a volume of 1 cm^3



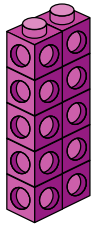


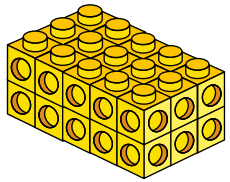


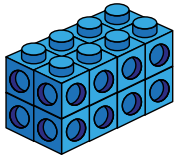


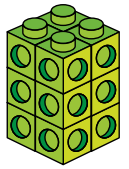
- Rosie makes some cuboids using cubes.

Each cube has a volume of 1 cm^3





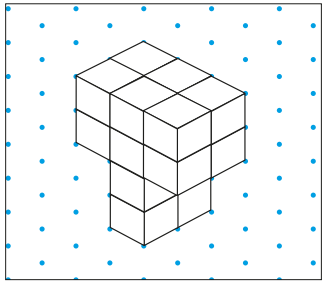




What is the volume of each cuboid? How did you work it out?

- Scott draws a "T" shape on isometric paper.

How many cubes does he need to make his 3-D shape?

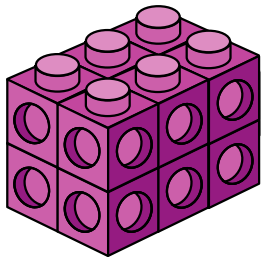


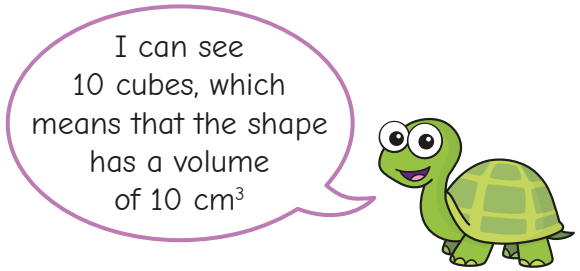
Cubic centimetres

Reasoning and problem solving

Dani makes this cuboid.

Each cube has a volume of 1 cm^3





Do you agree with Tiny?

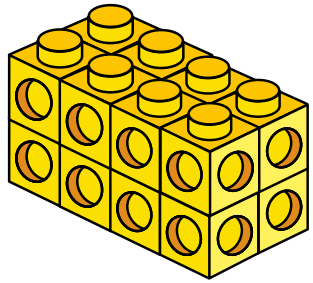
Explain your answer.

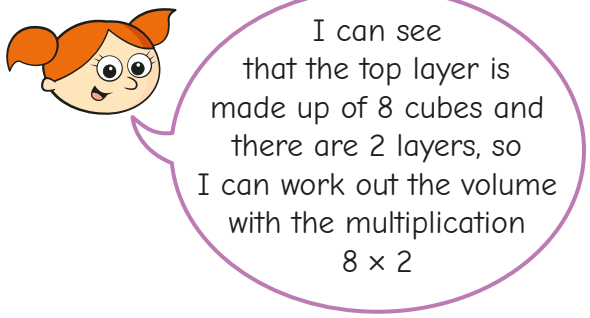
No

There are two cubes that cannot be seen.

volume = 12 cm^3

Alex is working out the volume of this cuboid.





Is Alex correct?

Explain your answer.

Yes

Compare volume

Notes and guidance

This small step builds on the previous step by comparing the volumes of different shapes. In Year 3, children compared the volume of liquid in different containers using simple vocabulary. In this small step, they find the volume of different shapes by counting cubes, then decide which shape has the greater volume.

Begin by looking at 3-D shapes made from interlocking cubes, asking children to say which contains more cubes and so has the greater volume. Children can then move on to pictorial representations, working out the number of cubes needed to make each shape before deciding which has the greater volume.

Finally, children compare cuboids. They may find it easier to make the cuboids themselves in order to work out the volume, or they may count the number of cubes in each layer, then multiply this by the height of the shape.

Things to look out for

- Children may assume that a taller shape always has a greater volume.
- Children may say that a shape with more cubes in it has a greater volume than one with fewer cubes, without considering the sizes of the cubes.

Key questions

- What is volume?
- What is a cubic centimetre?
- How can you find the total volume of the shape?
- What is the volume of shape A?
- How can you tell which shape has the greater volume?
- Which has the greater volume, shape A or shape B?
- Are the cubes the same size? Why does this matter?

Possible sentence stems

- The volume of shape A is _____ and the volume of shape B is _____

  Shape _____ has the greater volume.
- To work out the volume of the shape I can...

National Curriculum links

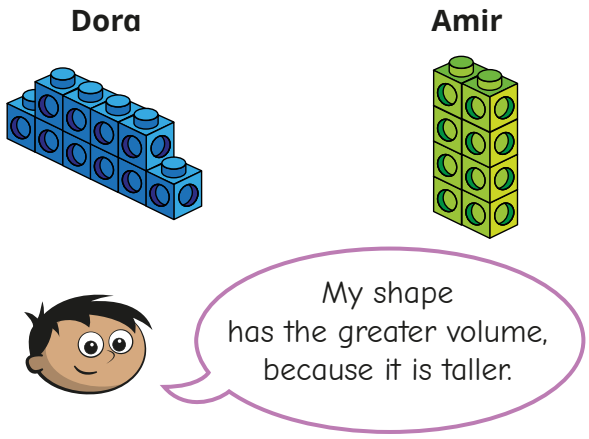
- Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity

Compare volume

Key learning

- Dora and Amir each make a shape using cubes.

  Each cube has a volume of 1 cm^3



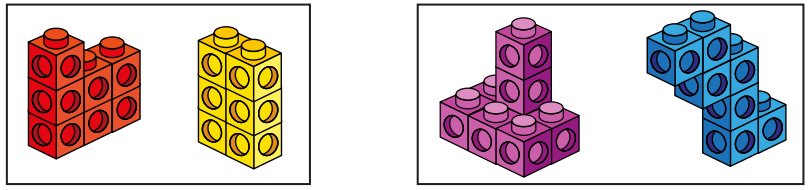
  Do you agree with Amir?

  Explain your answer.

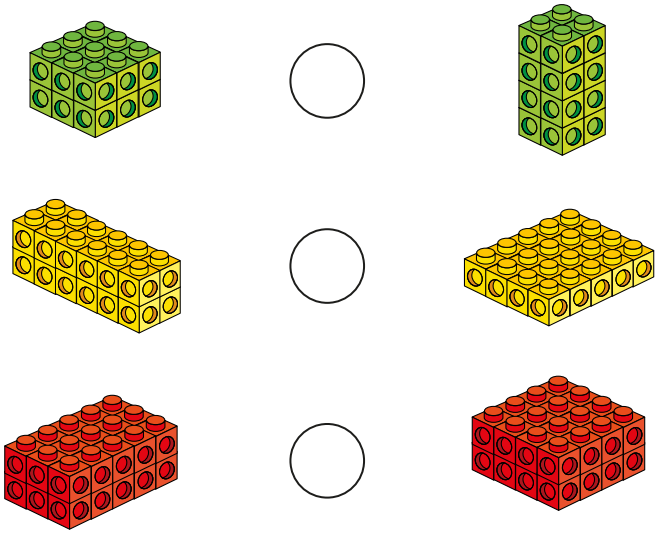
- Each cube has a volume of 1 cm^3

  What are the volumes of the shapes?

  In each pair, which shape has the greater volume?

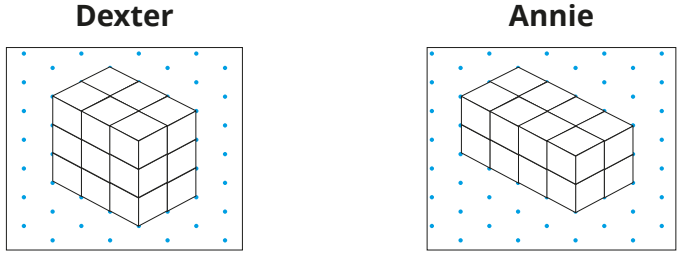


- Write <, > or = to compare the volumes of the cuboids.



- Dexter and Annie each draw a cuboid on isometric paper.

  Whose cuboid has the greater volume?



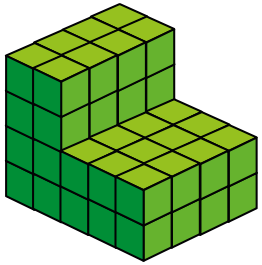
Compare volume

Reasoning and problem solving

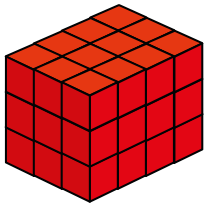
Huan, Esther and Tom each build a shape using cubes.

Each cube has a volume of 1 cm^3

Huan



Esther



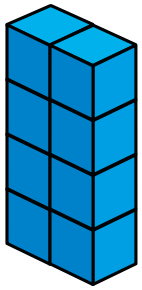
Tom's shape has a volume that is greater than Esther's but smaller than Huan's.

What could the volume of Tom's shape be?

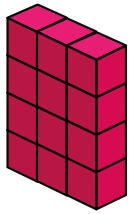
any volume between 36 cm^3 and 56 cm^3

Jo and Brett each make a shape using cubes.

Jo



Brett



The volume of my shape is 8 cubes and Brett's shape is 12 cubes, so Brett's shape has a greater volume.

Do you agree with Jo?

Explain your answer.

No

Estimate volume

Notes and guidance

In this small step, children estimate the volumes of different objects, by using cubes with a volume of 1 cm^3 and building a shape similar to the 3-D object.

Give children cubes and ask them to estimate the volumes of objects found in the classroom. For example, they could estimate the volume of a small book by making a similar-sized cuboid with interlocking cubes. For each object, discuss whether the actual volume is greater or less than the estimate. For example, an apple may have a smaller volume than that of a similar-sized cuboid.

Children then consider the volumes of much larger objects such as rooms. They discuss why cubic centimetres would be inappropriate for larger volumes and think about the need for different units such as cubic metres.

Things to look out for

- Some objects will be harder to recreate using interlocking cubes than others.
- Children may need support to decide if the estimated volume is greater or less than the actual volume.

Key questions

- What is volume?
- How could you estimate the volume of the shape?
- Which of these two objects has the greater volume?
- How can you use cubes to estimate the volume of an object?
- If object A has a volume of _____, what do you estimate the volume of object B will be?
- Is the actual volume greater or less than the estimated volume?

Possible sentence stems

- I estimate that the volume of _____ is _____ cm^3
- The actual volume of _____ is greater/less than the estimate.

National Curriculum links

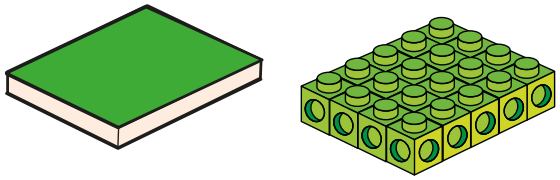
- Estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes)] and capacity

Estimate volume

Key learning

- Mo wants to estimate the volume of the book using cubes.

  He makes a cuboid.

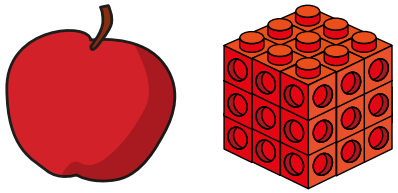


  Work out an estimate for the volume of the book.

  Is the actual volume of the book exactly the same as the estimate?

- Aisha is using cubes to estimate the volume of the apple.

  Each cube has a volume of 1 cm^3

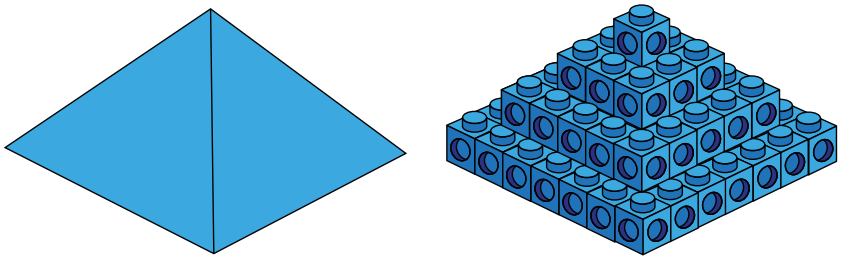


  Work out an estimate for the volume of the apple.

  Is the actual volume of the apple greater or smaller than the estimate?

- Filip is using cubes to estimate the volume of the pyramid.

  Each cube has a volume of 1 cm^3



  Work out an estimate for the volume of the pyramid.

  Is the volume of the pyramid greater or smaller than the estimate?

- Why would you not use cubic centimetres to measure the volume of a room?

  What different cubic unit could you use instead?

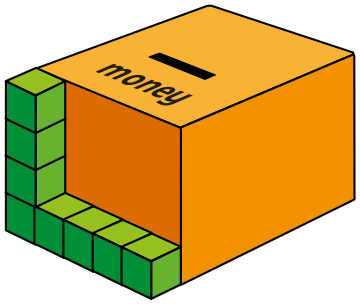
- Estimate the volume of:
  - your classroom
  - the school hall
  - your bedroom

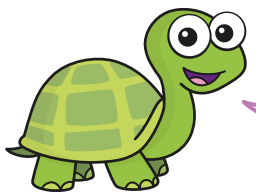
Estimate volume

Reasoning and problem solving

Tiny is using cubes to estimate the volume of a money box.

Each cube has a volume of 1 cm^3





The volume is about 20 cm^3

What mistake has Tiny made?

What is the approximate volume of the money box?

Tiny has not taken into account the depth of the money box.

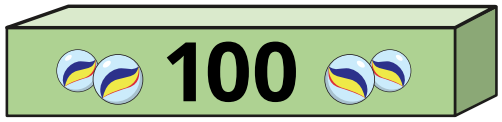
approximately 100 cm^3

Max has a toy box.

I can fit 8 boxes of marbles in my toy box.

Each box of marbles can hold 100 marbles.

Each marble has a volume of 0.8 cm^3



Estimate the volume of Max's **toy box**.

Is the actual volume of Max's toy box greater or smaller than your estimate?

640 cm^3

Estimate capacity

Notes and guidance

In the final small step of this block, children move on to looking at the capacity of different objects.

Children should be aware of the difference between capacity and volume from earlier learning, knowing that the capacity of, for example, a jug is how much liquid the jug can hold and that volume refers to how much liquid is actually in the jug. They should also know that the term "capacity" is most commonly used when looking at amounts of liquid, and they will have met the measures litres and millilitres as far back as Year 2. They may need reminding that 1 litre is equal to 1,000 millilitres.

Spend some time showing children containers of different sizes, discussing the capacity of each, then matching capacities to containers. Looking at containers that children may be more familiar with, such as a 330 millilitre can and a 2 litre bottle, will help them with estimating the capacity of unknown containers. They can then estimate the capacity of a container where a known amount of something is already inside it.

Things to look out for

- Children may confuse volume and capacity.
- Children may need support to identify which units to use.

Key questions

- What is capacity?
- What is the difference between capacity and volume?
- Which of these containers has the greater capacity? How do you know?
- If there is _____ ml in the jug now, approximately how much will it hold when full?
- What units of measure are used for the capacity of bottles?
- How many millilitres are there in a litre?
- About how many times bigger is the _____ than the _____?

Possible sentence stems

- The capacity of the container is _____ millilitres/litres.

  The volume of water in the container is about _____ millilitres/litres.
- Container A is about _____ times the size of container B.

National Curriculum links

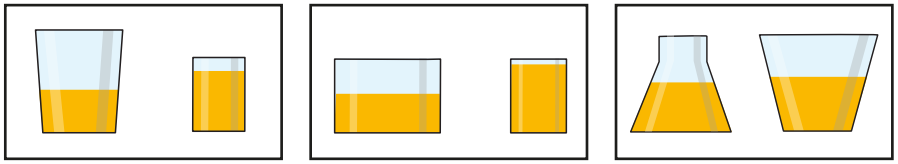
- Estimate volume and capacity [for example, using water]

Estimate capacity

Key learning

- Each pair of containers has the same amount of juice in it.

  Which container has the greater capacity in each pair?



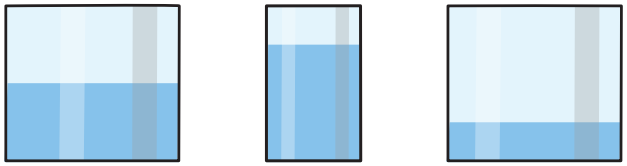
- What is the most appropriate capacity of a large bottle of fizzy drink?

20 ml	200 ml
2 litres	20 litres

What is the approximate capacity of a teacup?

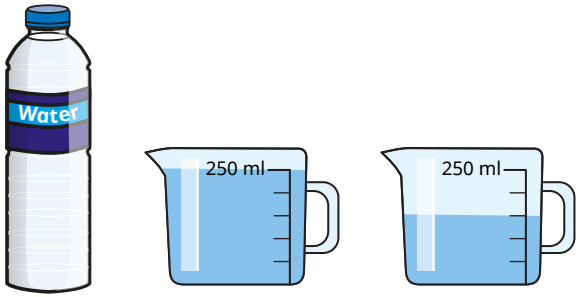
25 ml	150 ml
1.5 litres	15 litres

- There is 1 litre of water in each container.



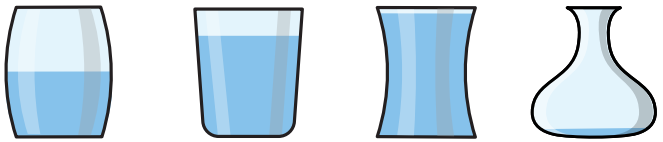
Estimate the capacity of each container.

- Sam pours all the water from the bottle into the two containers.



Estimate the capacity of the bottle.

- Each container has a capacity of 1 litre.

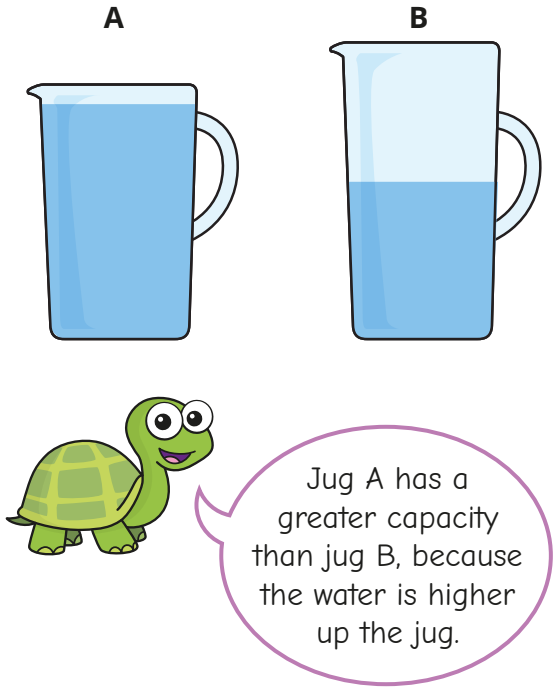


Estimate the volume of water in each container.

Estimate capacity

Reasoning and problem solving

There is 500 ml of water in each jug.



Do you agree with Tiny?

Explain your answer.

No

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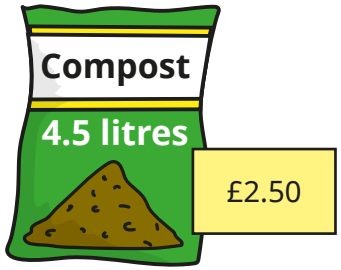
1 cubic centimetre of water is the same as 1 millilitre of water and has a mass of 1 gram.

What is the mass of 1 litre of water?

1,000 g or 1 kg

Ron buys compost to fill his flower bed.



He spends £17.50 on compost.

Estimate the capacity of Ron's flower bed.

31.5 litres