Year 5 Lesson Approach – Chapter 13 Volume

Chapter Overview

In this chapter, pupils are exploring volume. In the first lesson, they learn about the volume of solids and how to use cubes to determine volume. Then they look at the volume of specific shapes such as rectangular boxes. The term 'capacity' is revisited in a lesson in the middle of this chapter, which helps pupils differentiate between 'volume' and 'capacity'. Next, they learn to convert between different metric units and then between metric and imperial units. The chapter ends with pupils solving increasingly challenging word problems related to volume.

Lesson 1: Understanding the Volume of Solids

To begin this lesson, show pupils the In Focus task and give them some time to consider the question. Provide pupils with 1-cm^3 cubes. How many different solids can you make? Ask them if they can make two different solids using 2 cubes. What solids do you think you can make? Allow pupils time to make these shapes. What do you think about the shapes? Are they different? Lead pupils to realise the solids are the same because they have just been turned on different sides. What can you say about how much space the solid occupies? It occupies 2 cubes.

How many solids can you make using 3 cubes? Can you make two different solids? What can you say about the volume? Ask pupils if they agree that the shapes have the same 'volume'. How many solids can you make using 4 cubes? Allow pupils time to explore different 4-cube solids to see that they all have the same volume. Then ask pupils to make the solids in Let's Learn 4 and ask them to compare the volumes. Which has a larger volume? By how much? How much space do they occupy?

During Guided Practice, pupils are comparing solids with different volumes.

Lesson 2: Finding the Volume of Solids

To begin this lesson, show pupils the In Focus task and give them some time to read the information. Emma is holding a unit cube. Is it true that each side of the cube is 1 cm? Why has she referred to it as a cubic centimetre? What does that mean? Give pupils a chance to talk to each other about their thoughts. So how many cubic centimetres would there be in 4 cubes? 6 cubes? 10 cubes?

Tell pupils that Charles has a clever way of recording a solid made out of unit cubes. Direct their attention to the diagram. What has Charles done? Why are a number of boxes labelled with the number 1 and one is labelled with the number 3? What does that mean? Give pupils a chance to make the connection between the 3-D image and the 2-D diagram. I can only see 7 cubes. Why does Charles say there are 8? Where is the missing cube?

What other shapes can we make? What would a rectangle look like if it is 2 cm in width and 4 cm in length? Give pupils a chance to draw a diagram with each box labelled 1 to represent the height of 1 cube. What

other shapes can you make? Ask pupils to explore making shapes and then draw a diagram to show what they made using Charles' method. How would you show that a space is not occupied? Work through the examples in Let's Learn with the class.

During Guided Practice, pupils are find the volume of various 3-D shapes and completing sentences to show their understanding of volume as measured in cubic centimetres.

Lesson 3: Finding the Volume of Solids

To begin this lesson, show pupils the In Focus task and allow them some time to consider it. What information do we have? What does ‘using no more than 12’ mean? Does it mean we have to use 12 unit cubes? Agree that it means we can use less than 12. Then give pupils time to explore making different cubes and cuboids using unit cubes. Ask them what Emma means when she says, 'A cube is a special kind of cuboid.' What is special about a cube? Lead them to understand that a cube is a symmetrical solid with each side being equal.

Tell the class that Charles made one cuboid that occupied 8 times as much space as 1 unit cube. If each unit cube is equal to 1 cubic centimetre, what would the volume of a solid 8 times bigger be? How can we write centimetres cubed? Can you make the solids the children have created? What can you say about their volumes?

Ask pupils to create different cuboids using all 12 unit cubes. What different cuboids do you think you can create? How can you write a sum to help find their volumes? Tell them that knowing about a ‘layer’ helps. What does ‘layer’ mean? Ask pupils to make the shapes in Let’s Learn 4 and identify the number of cubes in each layer. Show the class how to write the volume of each solid as the sum of its layers.

During Guided Practice, pupils are finding the volume of cuboids.

Lesson 4: Finding the Capacity of Rectangular Boxes

To begin this lesson, show pupils the In Focus task and give them some time to read and think about the problem. What do we need to do to solve this problem? How do we measure space? How many unit cubes do you think would fit into this box? Tell them it would take a very long time to fill this box with unit cubes. But we could fill the bottom layer with 40 unit cubes and the box is 5 layers high, this could help us to solve the problem. Is this true? How can we use this information? Allow pupils time to make the connection that 5 layers of 40 would be 200 cubes. How would this be written as a volume? Use Let's Learn 1 to show them.

Tell pupils that there is another box, which is smaller than this and can take 6 unit cubes along the internal length, 3 unit cubes along the internal width and 4 unit cubes along the internal height. Using this information, is it possible to use multiplication to find the capacity of this box? What would we have to do? Give pupils time to explore how to work this out. What might the capacity be? Guide pupils towards

multiplying 6 cm^3 by 3 and then by 4. The capacity of the box should be 72 cm^3. Use Let's Learn 2 to demonstrate the calculation.

During Guided Practice, pupils are using the length, width and height to find the capacity of two cuboid shapes. They are also calculating how many specific-sized cubes would fit inside a set capacity.

Lesson 5: Finding the Capacity of Rectangular Boxes

To begin this lesson, show pupils the In Focus task and allow them some time to attempt to solve the problem. What do we need to do to solve this problem? Give pupils a copy of the net of the box to help them explore this. Ask them if they agree that because the shape is flat we must be finding the area. What is wrong with saying that? Lead pupils to understand that this is the net of a box and we've been asked to find out how much space there is in the box, so we are finding the volume.

Tell pupils the base of the box is 10 cm × 10 cm, and we label the missing side length as 10 cm. How many unit cubes would there be in one layer? Ask pupils to show you 10 cm × 10 cm in unit cubes. Can you see that we can use a 100 square of unit cubes rather than count out individual cubes? How many layers of unit cubes would be in the box? If there are 4 layers, how many unit cubes would there be in total? How would we write the volume 400 cubic centimetres?

Ask pupils what else they have been asked to do in the problem. To give our answer in cm^3 and millilitres (ml). If the volume of the box is 400 cm^3, what would the volume be in millilitres? Ask them if it is true that 1 cm^3 = 1 ml. If this is true, what would the volume be in millilitres? Ask pupils how we can check the volume of a container. Is there other equipment we can use? We can measure millimeters using a measuring beaker.

During Guided Practice, pupils are finding the volume of cubes and cuboids.