# Volume and Capacity Challenges

Aim: To measure and compare volume and capacity.

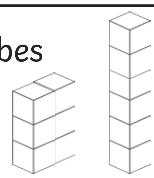
## Counting Cubes

**You will need connecting cubes for this activity.**

Make different cuboid shapes using interlocking cubes but keeping the same volume. Record your findings in the table.

Challenge: Which number of cubes do you think will make the most different cuboid shapes?

I think ____________________ cubes will make the most number of cuboid shapes.

| Number of Cubes | How many different cuboid shapes I can make? | What did the shapes look like? Write or draw your cuboid shapes. |
|---|---|---|
| 6 cubes | 2 | 1 × 6 cubes and 2 × 3 cubes  |
| 8 cubes | | |
| 12 cubes | | |
| 15 cubes | | |
| 16 cubes | | |
| 24 cubes | | |
| 31 cubes | | |

## A Variety of Volumes

**You will need a variety of containers with different capacities, water and a measuring container for this activity.**

Using a variety of containers, predict which will hold the least to the most capacity of water by arranging them in order. Number the containers and predict the volume of water each will hold. Record your predictions in the table. Using a measuring jug, accurately measure the volume of water that each container holds and record that in the table.

**Challenge: Calculate the difference between your prediction and the actual measurement.**

| Container Order | Prediction of volume of water held (ml). | Actual volume of water held (ml). | Difference (+ or - ml) |
|---|---|---|---|
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |
| Number _________ | | | __________________ ml |

# Volume and Capacity Challenges Answers

## Counting Cubes

| Number of Cubes | How many different cuboid shapes I can make? | What did the shapes look like? Write or draw your cuboid shapes. |
|---|---|---|
| 6 cubes | 2 | 1 × 6 cubes and 2 × 3 cubes |
| 8 cubes | 2 to 3 | 1 × 8, 2 × 4, 2 × 2 × 2 (3 arrangements) |
| 12 cubes | 4 | 1 × 12, 2 × 6, 3 × 4 (3 arrangements) |
| 15 cubes | 2 | 1 × 15, 3 × 5 (2 arrangements) |
| 16 cubes | 3 | 1 × 16, 2 × 8, 4 × 4 (3 arrangements) |
| 24 cubes | 4 | 1 × 24, 2 × 12, 3 × 8, 4 × 6 (4 arrangements) |
| 31 cubes | 1 | 1 × 31 (1 arrangement) |

## A Variety of Volumes.

Answers will vary. Check for accuracy of estimation and measuring capacity.

# Volume and Capacity Challenges

Aim: To estimate, measure and scale volume and capacity.

## What is the Volume of the Classroom?

**You will need measuring equipment for this activity.**

Your task is to estimate the volume of your class room, then to measure and calculate it.

Record your estimations in the table. You may need to section your room if it is a compound shape.

| Length estimation | Width estimation | Height estimation |
|---|---|---|
| | | |
| | | |
| | | |

What will help you to measure? A 30cm ruler? A metre stick? A tape measure? A trundle wheel?

Record your measurements in the table. You may need help from an adult to measure the height of your room.

| Length | Width | Height |
|---|---|---|
| | | |
| | | |
| | | |

**Challenge:** Calculate the volume of the classroom using the formula; length × width × height. Think about how to do this if your class room is a compound shape.

## It's a Matter of Scale

Imagine that you wanted to make scale models of your classroom. Calculate the dimensions and scaled volume based on the following scale adjustments.

| Scale adjustment | Scaled dimensions | Scaled volume |
|---|---|---|
| Your classroom is half the original size | l = __________<br>w = __________<br>h = __________ | __________ $m^3$ |
| Your classroom is 5 times the original size | l = __________<br>w = __________<br>h = __________ | __________ $m^3$ |
| Your classroom is a quarter the original size | l = __________<br>w = __________<br>h = __________ | __________ $m^3$ |
| Your classroom is a tenth the original size | l = __________<br>w = __________<br>h = __________ | __________ $m^3$ |

# Volume and Capacity Challenges Answers

## What is the Volume of the Classroom?

Answers will vary. Check for accuracy of estimation and measuring. Suggest repeat measuring if necessary.

Remind pupils of strategies for measuring compound shapes if necessary.

## It's a Matter of Scale

Recorded measurements from activity one should be scaled as follows:

Multiplied by 2, divided by 2, multiplied by 5, divided by 4. Volume should then be calculated using scaled dimensions.

# Volume and Capacity Challenges

Aim: To estimate, construct, compare and calculate the volume of cuboids using formulae.

## Growing Cubes

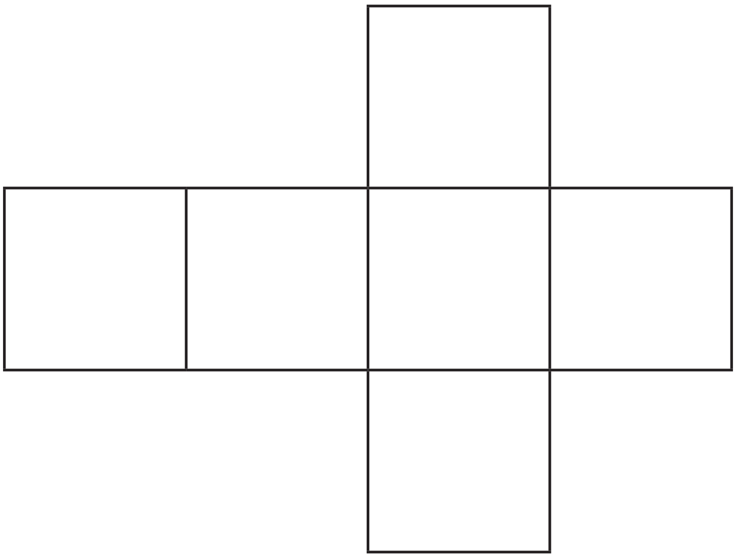
**You will need squared paper, scissors and tape for this activity.**

Your task is to make cubes of different sizes and to investigate what happens to the volume as the size of the cube increases.

Complete you estimations in the table before you begin and calculate the volume for each cube after you have made the model. Calculate the difference between your estimation and the actual volume.

| **Cube** | **Volume estimation** | **Volume calculation** | **Difference** (actual measurement and +, - or = prediction) |
|---|---|---|---|
| 1cm | | | |
| 2cm | | | |
| 3cm | | | |
| 4cm | | | |
| 5cm | | | |
| 6cm | | | |
| 7cm | | | |
| 8cm | | | |
| 9cm | | | |
| 10cm | | | |

Here is a diagram of how to make a net of a cube.  You will need to plan your net carefully in order to construct your cubes. Be sure to add tabs.



**Challenge**

I have a container that is 10cm long, 10cm wide and 15cm high. I want to fill it with water. How much water do I need? Record your answer in ml and l. Show your workings here.

_______________ l _______________ ml

# Volume and Capacity Challenges
# Answers

## Growing Cubes

| Cube | Volume estimation | Volume calculation | **Difference** (actual measurement and +, - or = prediction) |
|---|---|---|---|
| 1cm | $1cm^3$ | $1cm^3$ | = |
| 2cm | | $8cm^3$ | |
| 3cm | | $27cm^3$ | |
| 4cm | | $64cm^3$ | |
| 5cm | | $125cm^3$ | |
| 6cm | | $216cm^3$ | |
| 7cm | | $343cm^3$ | |
| 8cm | | $512cm^3$ | |
| 9cm | | $729cm^3$ | |
| 10cm | | $1000cm^3$ | |

## Challenge

10 x 10 x 15 = $1500cm^3$ 1l = $1000cm^3$; so $1500cm^3$ = 1.5l

There are 1000ml in every litre so $1500cm^3$ = 1500ml