

# Reasoning and Problem Solving

## Step 8: Volume of a Cuboid

### Teaching Note:

The formula for volume is  $l \times w \times h$  where  $l$  is horizontal,  $w$  is diagonal and  $h$  is vertical.

### National Curriculum Objectives:

Mathematics Year 6: (6M8a) [Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres \(cm<sup>3</sup>\) and cubic metres \(m<sup>3</sup>\), and extending to other units \[for example, mm<sup>3</sup> and km<sup>3</sup>\]](#)

### Differentiation:

Questions 1, 4 and 7 (Problem Solving)

**Developing** Find the pair of cuboids that could be used to make a compound rectilinear shape with a given volume. Includes the same metric measures used within each question and multiples of 2, 3, 5 and 10 only.

**Expected** Find all of the possible pairs of cuboids that could be used to make a compound rectilinear shape with a given volume. Includes the same metric measures used within each question and whole unit measurements only.

**Greater Depth** Find all of the possible pairs of cuboids that could be used to make a compound rectilinear shape with a given volume. Includes some conversions between metric measures and some measurements with up to 2 decimal places used.

Questions 2, 5 and 8 (Problem Solving)

**Developing** Find two missing dimensions when given the volume and 2 additional clues. Includes the same metric measures used within each question and multiples of 2, 3, 5 and 10 only.

**Expected** Find two missing dimensions when given the volume and 2 additional clues. Includes the same metric measures used within each question and whole unit measurements only.

**Greater Depth** Find two missing dimensions when given the volume and 2 additional clues. Includes some conversions between metric measures and some measurements with up to 2 decimal places used.

Questions 3, 6 and 9 (Reasoning)

**Developing** Explain if a comparison statement about the volume of two cuboids is correct. Includes the same metric measures used within each question and multiples of 2, 3, 5 and 10 only.

**Expected** Explain if a comparison statement about the volume of two cuboids is correct. Includes the same metric measures used within each question and whole unit measurements only.

**Greater Depth** Explain if a comparison statement about the volume of two cuboids is correct. Includes some measurements with 1 decimal place used.

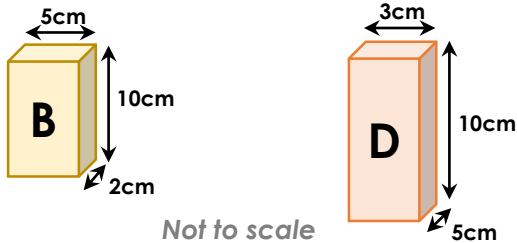
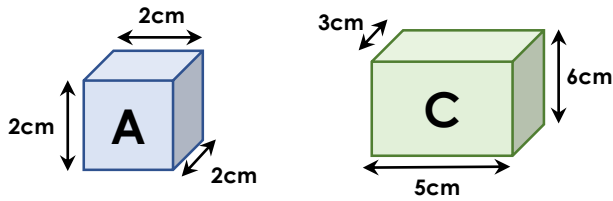
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## Volume of a Cuboid

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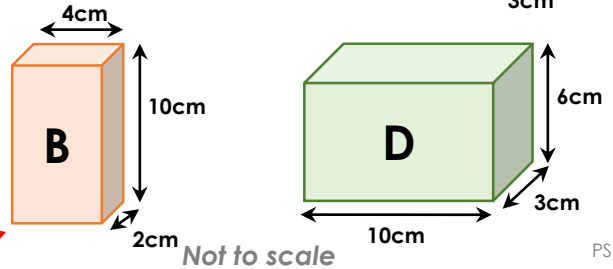
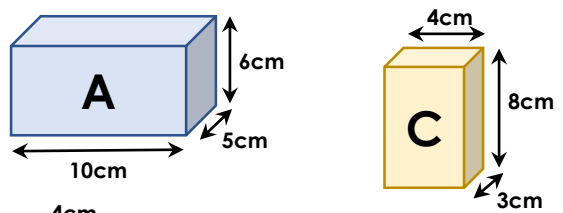
1a. Find the pair of shapes which can be used to make a compound rectilinear shape with a volume less than  $100\text{cm}^3$ .



Not to scale

PS

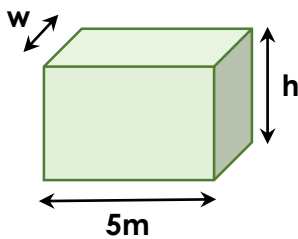
1b. Find the pair of shapes which can be used to make a compound rectilinear shape with a volume less than  $200\text{cm}^3$ .



Not to scale

PS

2a. Use the clues to find the missing dimensions of this cuboid.

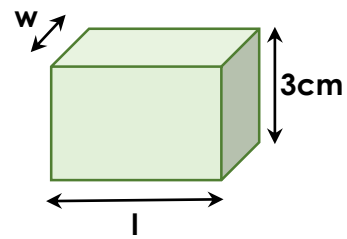


- Its volume is  $30\text{m}^3$ .
- The total of the length, width and height is  $10\text{m}$ .
- The width is  $1\text{m}$  less than the height.

Not to scale

PS

2b. Use the clues to find the missing dimensions of this cuboid.

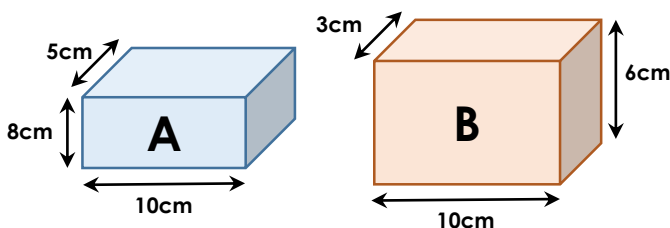


- Its volume is  $60\text{cm}^3$ .
- The total of the length, width and height is  $15\text{cm}$ .
- The width is less than half of the length.

Not to scale

PS

3a. Bella is comparing two containers.



Shape A has a smaller volume than shape B.

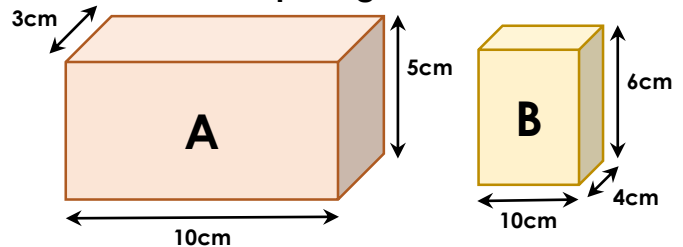


Is she correct? Explain your reasoning.

Not to scale

R

3b. Oscar is comparing two containers.



Shape B has a larger volume than shape A.



Is he correct? Explain your reasoning.

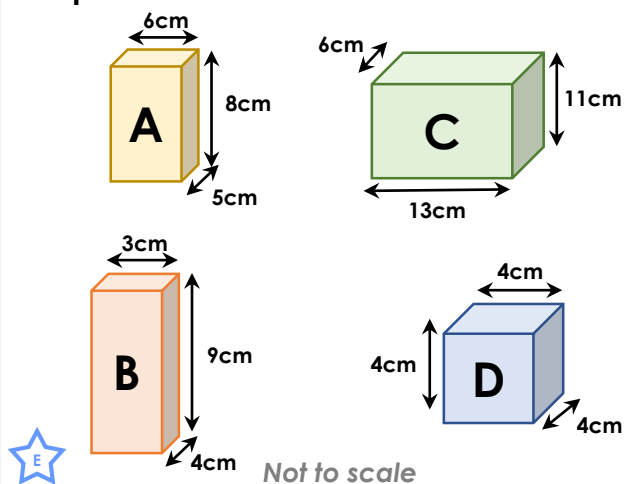
Not to scale

R

## Volume of a Cuboid

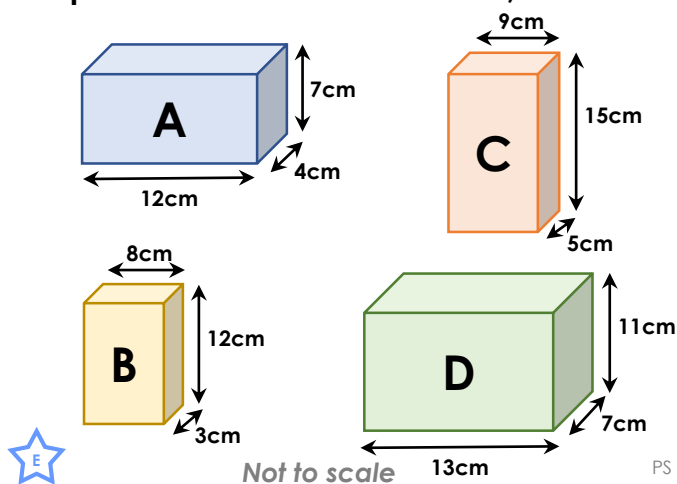
## Volume of a Cuboid

4a. Find the pairs of shapes which can be used to make a compound rectilinear shape with a volume less than  $400\text{cm}^3$ .



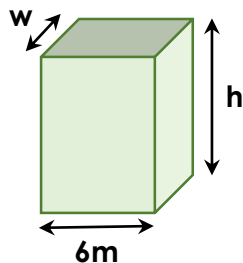
PS

4b. Find the pairs of shapes which can be used to make a compound rectilinear shape with a volume less than  $1,000\text{cm}^3$ .



PS

5a. Use the clues to find the missing dimensions of this cuboid.



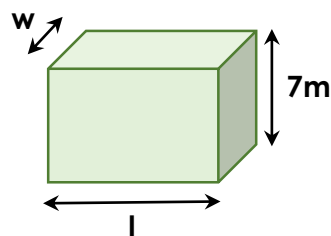
- Its volume is  $720\text{m}^3$ .
- The total of the length, width and height is  $32\text{m}$ .
- The width is less than the height.



Not to scale

PS

5b. Use the clues to find the missing dimensions of this cuboid.



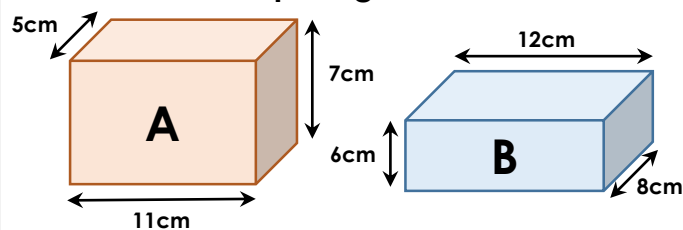
- Its volume is  $420\text{m}^3$ .
- The total of the length, width and height is  $24\text{m}$ .
- The width is less than half of the length.



Not to scale

PS

6a. Sarah is comparing two containers.



Shape A has a larger volume than shape B.



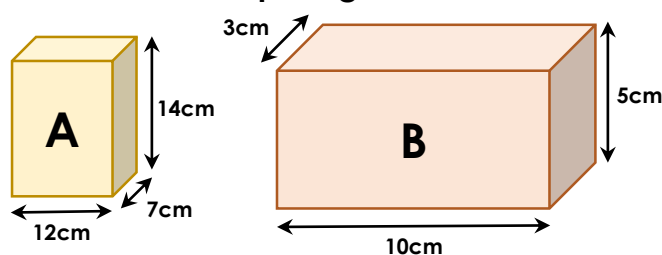
Is she correct? Explain your reasoning.



Not to scale

R

6b. Jason is comparing two containers.



Shape B has a smaller volume than shape A.



Is he correct? Explain your reasoning.



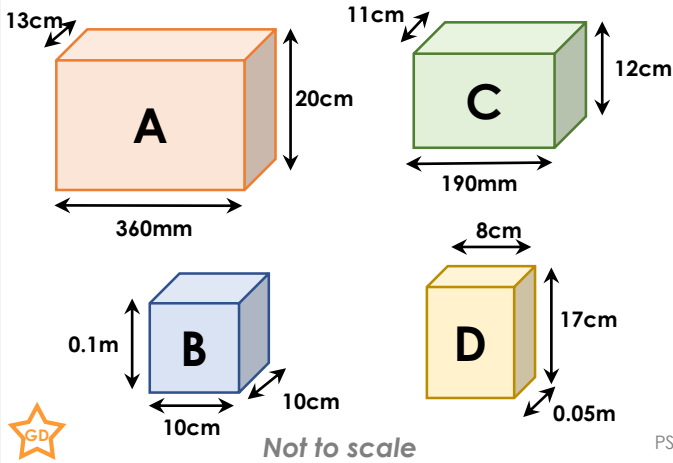
Not to scale

R

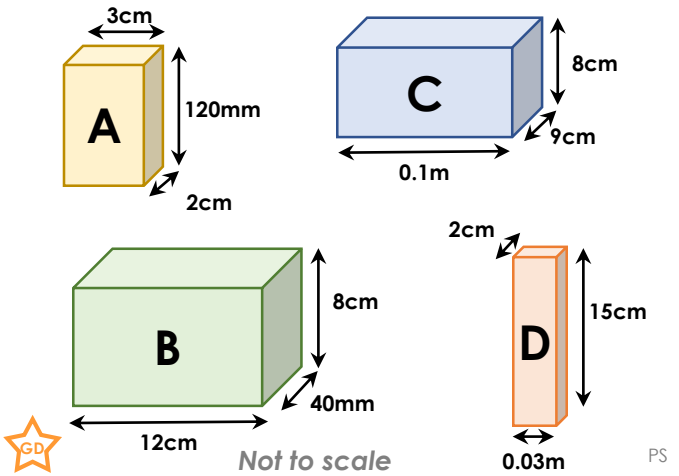
# Volume of a Cuboid

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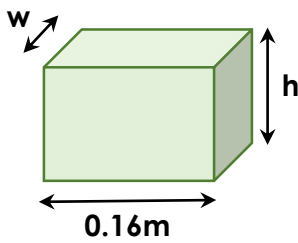
7a. Find the pairs of shapes which can be used to make a compound rectilinear shape with a volume less than  $5,000\text{cm}^3$ .



7b. Find the pairs of shapes which can be used to make a compound rectilinear shape with a volume more than  $480\text{cm}^3$ .



8a. Use the clues to find the missing dimensions of this cuboid.



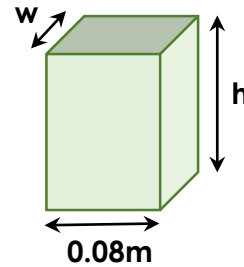
- Its volume is  $768\text{cm}^3$ .
- The total of the length, width and height is  $0.32\text{m}$ .
- The width is a third of the height.

GD

PS

Not to scale

8b. Use the clues to find the missing dimensions of this cuboid.



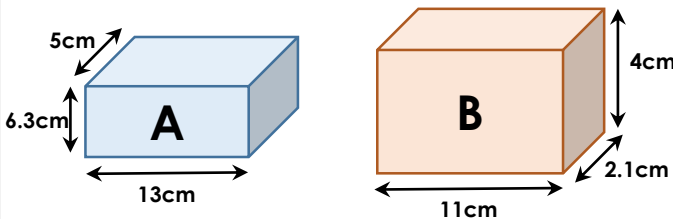
- Its volume is  $288\text{cm}^3$ .
- The total of the length, width and height is  $23\text{cm}$ .
- The width is a quarter of the height.

GD

PS

Not to scale

9a. Lily is comparing two containers.



Shape A has a larger volume than shape B.



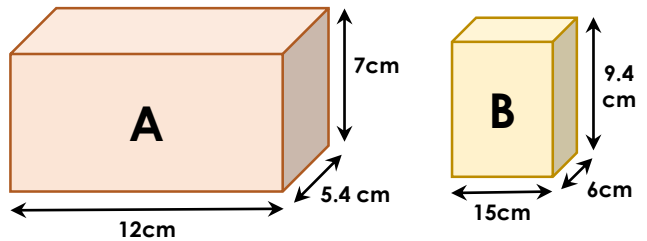
Is she correct? Explain your reasoning.

GD

R

Not to scale

9b. Marvin is comparing two containers.



Shape A has a larger volume than shape B.



Is he correct? Explain your reasoning.

GD

R

Not to scale

## Reasoning and Problem Solving Volume of a Cuboid

### Developing

1a.  $A = 8\text{cm}^3$ ;  $B = 100\text{cm}^3$ ;  $C = 90\text{cm}^3$ ;  $D = 150\text{cm}^3$ . Shapes A and C.

2a.  $w = 2\text{m}$ ,  $h = 3\text{m}$

3a. Bella is not correct because the volume of A is  $400\text{cm}^3$  and the volume of B is  $180\text{cm}^3$ . Although B looks bigger than A, the drawings are not to scale.

### Expected

4a.  $A = 240\text{cm}^3$ ;  $B = 108\text{cm}^3$ ;  $C = 858\text{cm}^3$ ;  $D = 64\text{cm}^3$ . Shapes A and D, A and B or B and D.

5a.  $w = 6\text{m}$ ,  $h = 20\text{m}$

6a. Sarah is not correct because the volume of A is  $385\text{cm}^3$  and the volume of B is  $576\text{cm}^3$ . Although A looks taller and longer than B, the drawings are not to scale.

### Greater Depth

7a.  $A = 9,360\text{cm}^3$ ;  $B = 1,000\text{cm}^3$ ;  $C = 2,508\text{cm}^3$ ;  $D = 680\text{cm}^3$ . Shapes B and C, B and D or C and D.

8a.  $w = 4\text{cm}$ ,  $h = 12\text{cm}$

9a. Lily is correct because the volume of A is  $409.5\text{cm}^3$  and the volume of B is  $92.4\text{cm}^3$ .

## Reasoning and Problem Solving Volume of a Cuboid

### Developing

1b.  $A = 300\text{cm}^3$ ;  $B = 80\text{cm}^3$ ;  $C = 96\text{cm}^3$ ;  $D = 180\text{cm}^3$ . Shapes B and C.

2b.  $l = 10\text{cm}$ ,  $w = 2\text{cm}$

3b. Oscar is correct because the volume of A is  $150\text{cm}^3$  and the volume of B is  $240\text{cm}^3$ .

### Expected

4b.  $A = 336\text{cm}^3$ ;  $B = 288\text{cm}^3$ ;  $C = 675\text{cm}^3$ ;  $D = 1,001\text{cm}^3$ . Shapes A and B or B and C.

5b.  $l = 12\text{cm}$ ,  $w = 5\text{cm}$

6b. Jason is correct because the volume of A is  $1,176\text{cm}^3$  and the volume of B is  $150\text{cm}^3$ .

### Greater Depth

7b.  $A = 72\text{cm}^3$ ;  $B = 384\text{cm}^3$ ;  $C = 720\text{cm}^3$ ;  $D = 90\text{cm}^3$ . Shapes A and B, B and D or A and D.

8b.  $w = 3\text{cm}$ ,  $h = 12\text{cm}$

9b. Marvin is not correct because the volume of A is  $453.6\text{cm}^3$  and the volume of B is  $846\text{cm}^3$ . Although A looks taller, longer and wider than B, the drawings are not to scale.