



THIRD SPACE
LEARNING

Diagnostic Questions

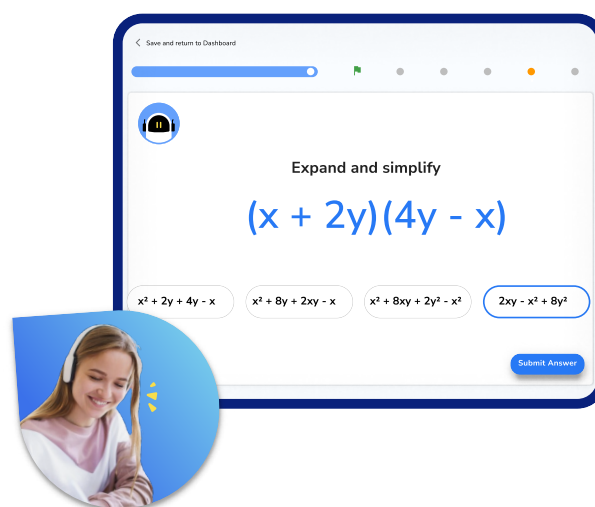
Volume & Surface Area |
Geometry & Measure

This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **volume & surface area** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

How to use the questions in this resource

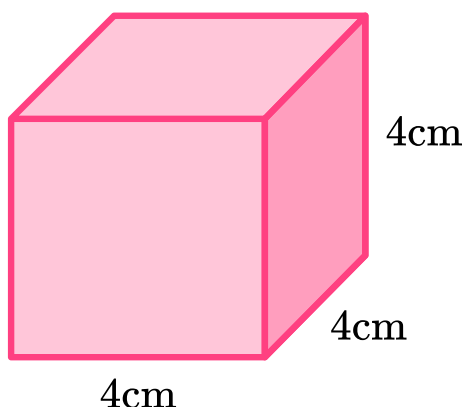
There are 20 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Calculating the incorrect property**, **Missing faces**, **Converting units**, and **Substitution into formulae**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

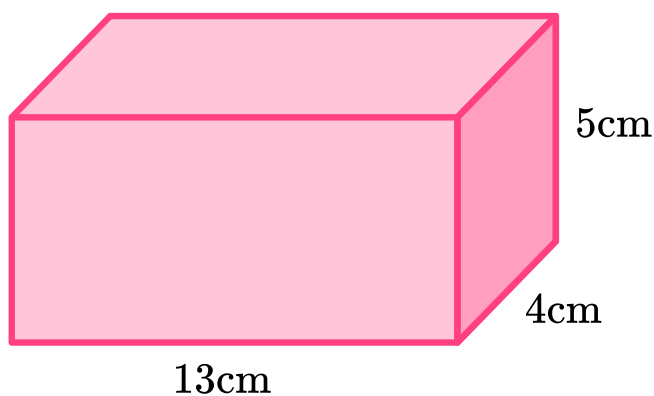
Diagnostic Questions: Volume & Surface Area

1. Find the volume of this cube, stating the appropriate units:



| | |
|----------------------|----------------------|
| A) 16 cm^3 | B) 12 cm^3 |
| C) 64 cm^3 | D) 48 cm^3 |

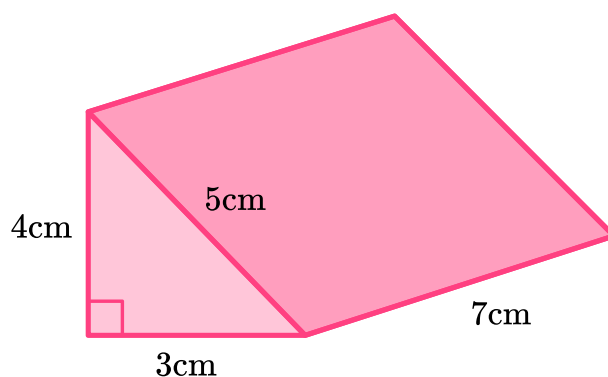
2. Find the volume of this cuboid, stating the appropriate units:



| | |
|-----------------------|-----------------------|
| A) 52 cm^3 | B) 130 cm^3 |
| C) 274 cm^3 | D) 260 cm^3 |

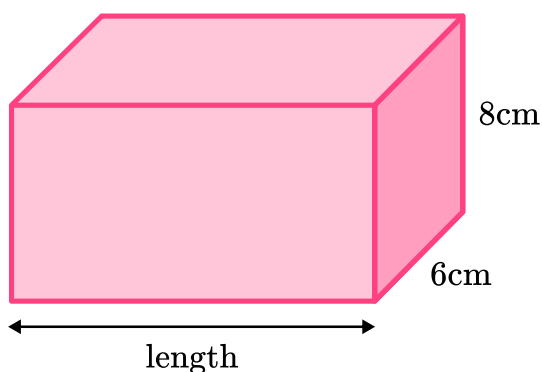
Diagnostic Questions: Volume & Surface Area

3. Find the volume of this triangular prism, stating the appropriate units:



| | |
|-----------------------|-----------------------|
| A) 42 cm^3 | B) 84 cm^3 |
| C) 420 cm^3 | D) 210 cm^3 |

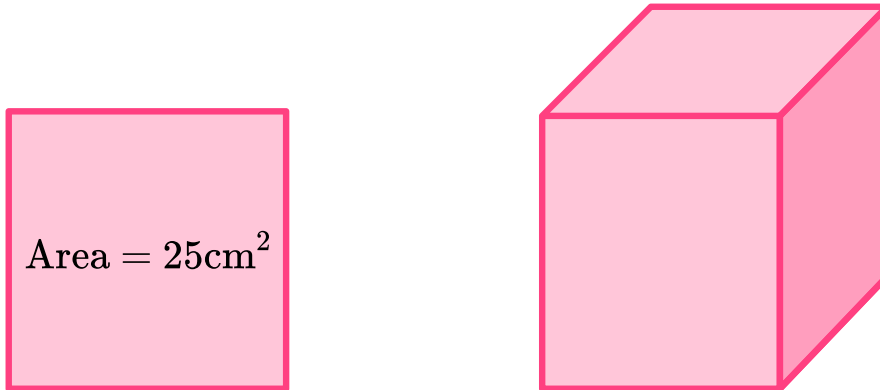
4. The volume of this cuboid is 552 cm^3 . Find the length of the base.



| | |
|---------------------|----------------------|
| A) 404 cm | B) 39.4 cm |
| C) 23 cm | D) 11.5 cm |

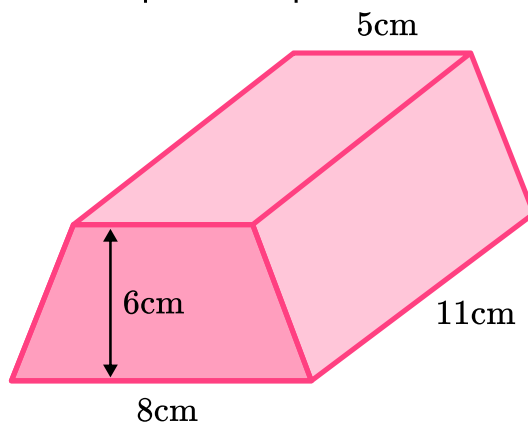
Diagnostic Questions: Volume & Surface Area

5. The area of one face of a cube is 25 cm^2 . Find the volume of the cube.



| | |
|-----------------------|-----------------------|
| A) 150 cm^3 | B) 125 cm^3 |
| C) 625 cm^3 | D) 244 cm^3 |

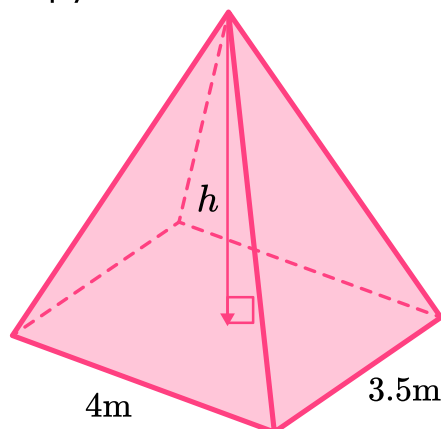
6. Calculate the volume of this trapezoidal prism:



| | |
|------------------------|-----------------------|
| A) 528 cm^3 | B) 264 cm^3 |
| C) 2640 cm^3 | D) 429 cm^3 |

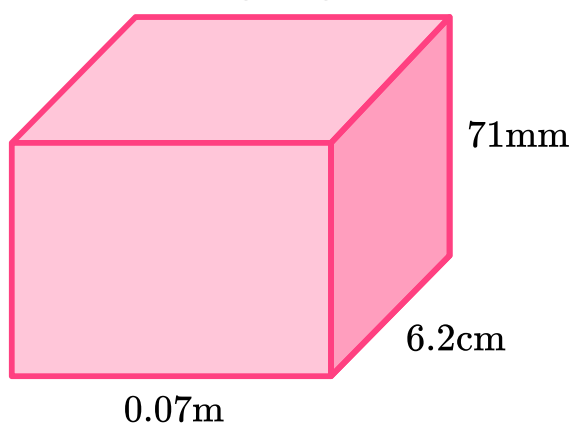
Diagnostic Questions: Volume & Surface Area

7. Calculate the volume of this pyramid when $h = 6m$:



| | |
|---------------------|---------------------|
| A) 84 m^3 | B) 42 m^3 |
| C) 28 m^3 | D) 14 m^3 |

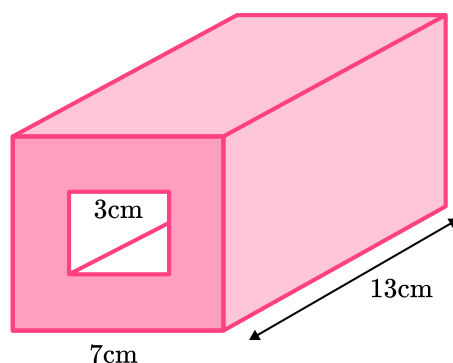
8. Calculate the volume of this cuboid giving your answer in cm^3 :



| | |
|--------------------------|--------------------------|
| A) 30.814 cm^3 | B) 308.14 cm^3 |
| C) 77.27 cm^3 | D) 3081.4 cm^3 |

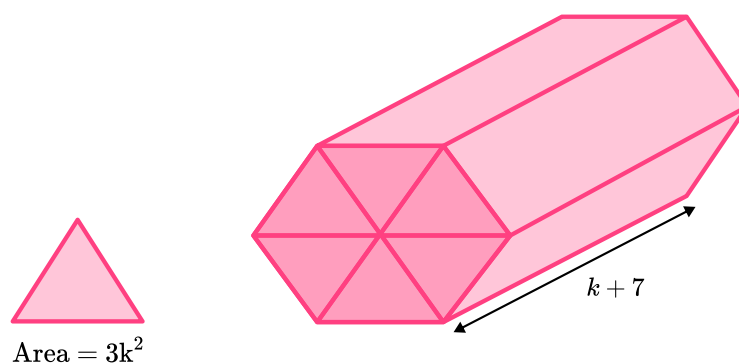
Diagnostic Questions: Volume & Surface Area

9. The cross-section of this prism is formed by removing a square of side length 3 cm from a square of side length 7 cm . Find the volume of the prism:



| | |
|----------------------|----------------------|
| A) 520 cm^3 | B) 637 cm^3 |
| C) 754 cm^3 | D) 273 cm^3 |

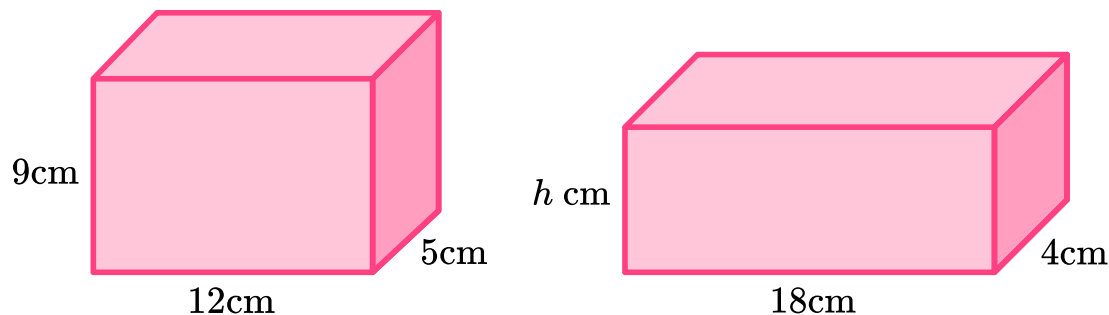
10. This prism has a cross-section formed from congruent triangles as shown. Derive an expression in expanded form for the volume of the prism.



| | |
|--------------------|---------------------|
| A) $3k^3 + 21k^2$ | B) $18k^3 + 7$ |
| C) $18k^2 + k + 7$ | D) $18k^3 + 126k^2$ |

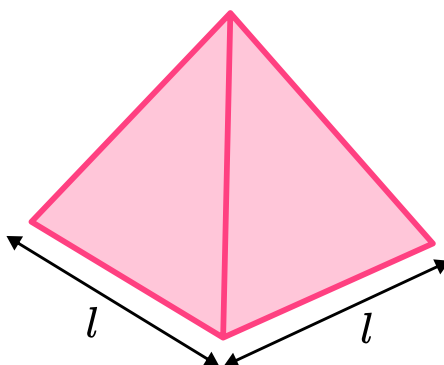
Diagnostic Questions: Volume & Surface Area

11. Both cuboids have the same volume. Determine length h .



| | |
|------------------|------------------|
| A) 30 <i>cm</i> | B) 4 <i>cm</i> |
| C) 7.5 <i>cm</i> | D) 120 <i>cm</i> |

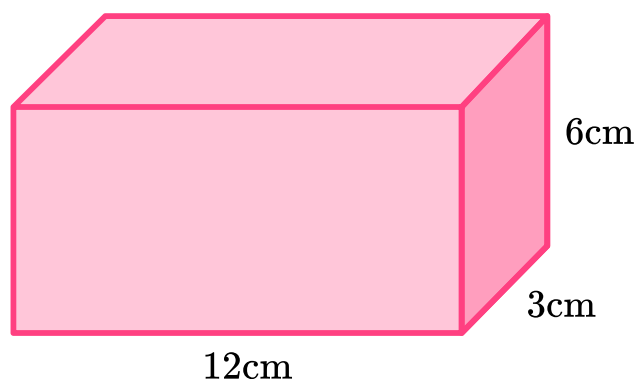
12. A square-based pyramid has height 8.5 *cm* and volume 102 *cm*³.
Determine length l .



| | |
|--------------------------|----------------|
| A) 36 <i>cm</i> | B) 6 <i>cm</i> |
| C) $2\sqrt{3}$ <i>cm</i> | D) 2 <i>cm</i> |

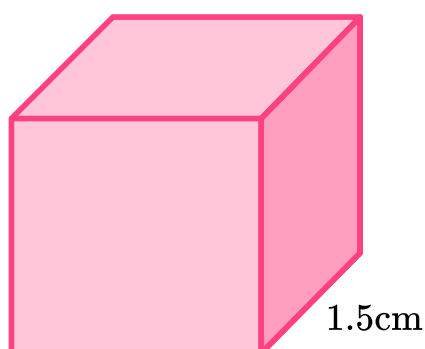
Diagnostic Questions: Volume & Surface Area

13. Determine the surface area of the cuboid:



| | |
|-----------------------|-----------------------|
| A) 216 cm^2 | B) 126 cm^2 |
| C) 252 cm^2 | D) 84 cm^2 |

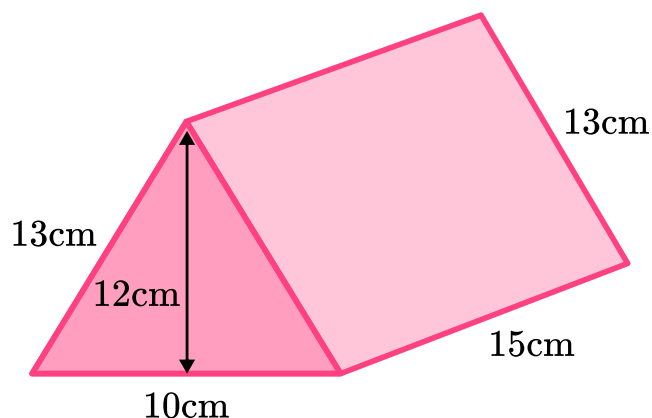
14. Calculate the surface area of this cube, giving your answer in mm^2 .



| | |
|------------------------|------------------------|
| A) 13.5 mm^2 | B) 135 mm^2 |
| C) 225 mm^2 | D) 1350 mm^2 |

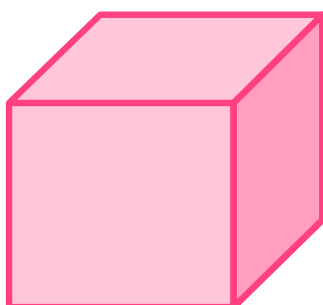
Diagnostic Questions: Volume & Surface Area

15. Find the surface area of this triangular prism:



| | |
|-----------------------|-----------------------|
| A) 660 cm^2 | B) 780 cm^2 |
| C) 255 cm^2 | D) 900 cm^2 |

16. Given that the volume of this cube is 343 cm^3 , work out the surface area of the cube:

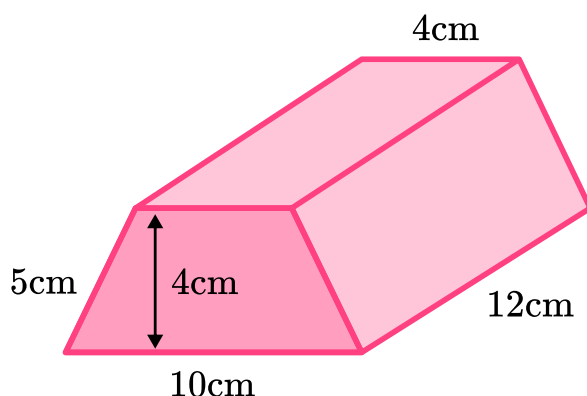


$$\text{Volume} = 343 \text{ cm}^3$$

| | |
|-----------------------|-----------------------|
| A) 49 cm^2 | B) 7 cm^2 |
| C) 147 cm^2 | D) 294 cm^2 |

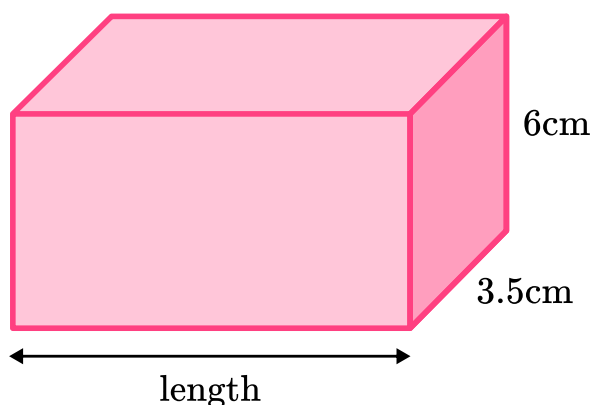
Diagnostic Questions: Volume & Surface Area

17. The cross-section of this prism is an isosceles trapezium.
Calculate the surface area of the prism.



| | |
|-----------------------|-----------------------|
| A) 344 cm^2 | B) 400 cm^2 |
| C) 336 cm^2 | D) 136 cm^2 |

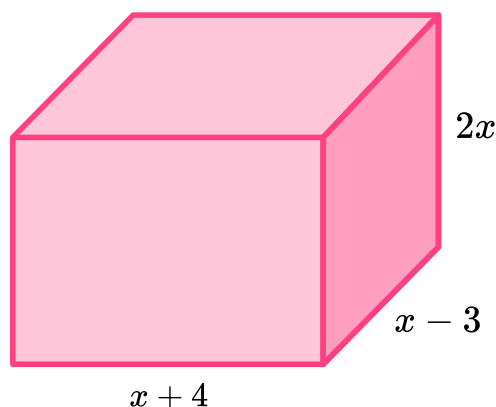
18. The surface area of this cuboid is 194 cm^2 . Work out the volume of the cuboid.



| | |
|-------------------------|-----------------------|
| A) 189 cm^3 | B) 231 cm^3 |
| C) 184.5 cm^3 | D) 168 cm^3 |

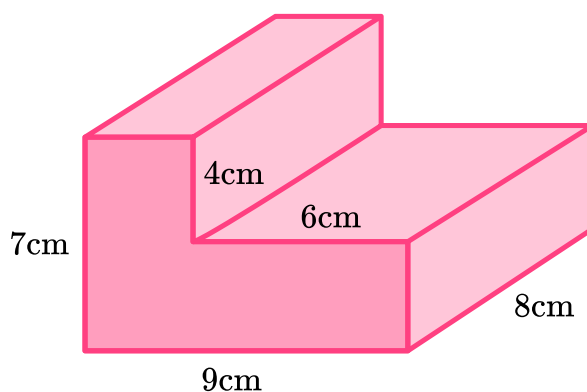
Diagnostic Questions: Volume & Surface Area

19. Derive an expression for the surface area of this cuboid:



| | |
|------------------------|----------------------|
| A) $2x^3 + 2x^2 - 24x$ | B) $10x^2 + 6x - 24$ |
| C) $5x^2 + 3x - 12$ | D) $4x + 1$ |

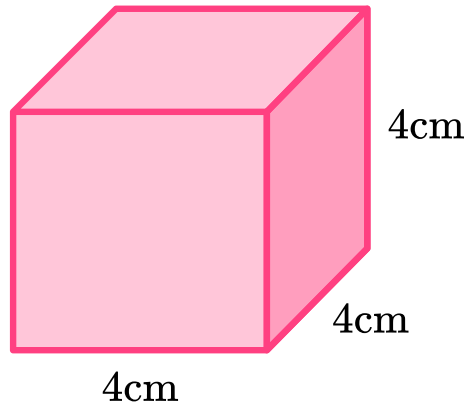
20. Calculate the surface area of the prism:



| | |
|-----------------------|-----------------------|
| A) 167 cm^2 | B) 334 cm^2 |
| C) 312 cm^2 | D) 295 cm^2 |

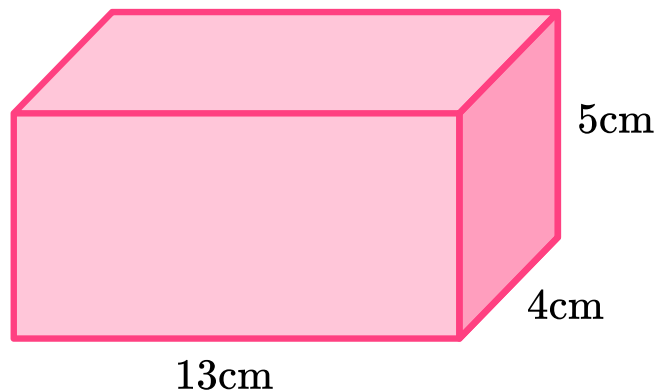
Diagnostic Questions: Volume & Surface Area Answers

1. Find the volume of this cube, stating the appropriate units:



- A) 16 cm^3 Student found the area of one face
- B) 12 cm^3 Student found the sum of the three given edge lengths
- C) 64 cm^3 Correct answer
- D) 48 cm^3 Student found the sum of all twelve edge lengths

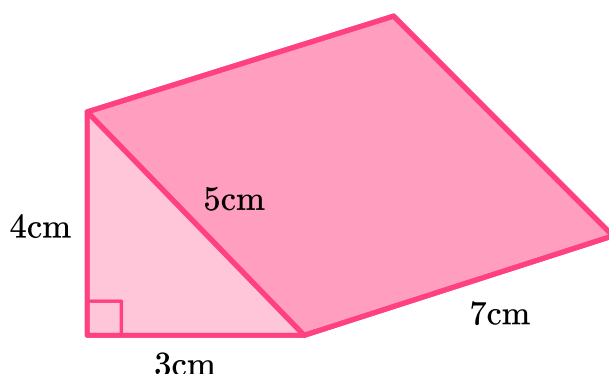
2. Find the volume of this cuboid, stating the appropriate units:



- A) 52 cm^3 Student forgot to multiply base area by height
- B) 130 cm^3 Student halved the volume
- C) 274 cm^3 Student confused volume and surface area
- D) 260 cm^3 Correct answer

Diagnostic Questions: Volume & Surface Area Answers

3. Find the volume of this triangular prism, stating the appropriate units:



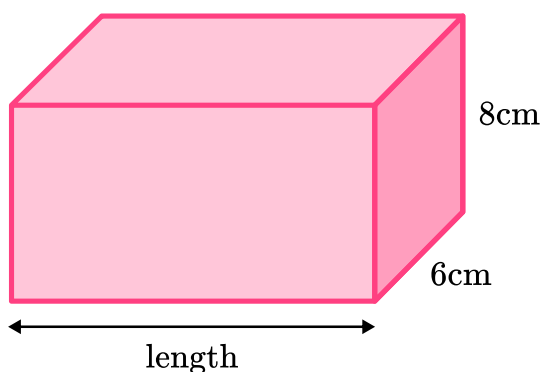
A) 42 cm^3 Correct answer

B) 84 cm^3 Student forgot to multiply by a half when finding the cross-sectional area

C) 420 cm^3 Student found the product of all four given edge lengths

D) 210 cm^3 Student halved the product of all four given edge lengths

4. The volume of this cuboid is 552 cm^3 . Find the length of the base.



A) 404 cm Student subtracted the product of 8 and 6 from the volume

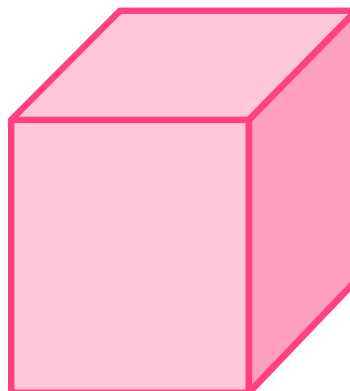
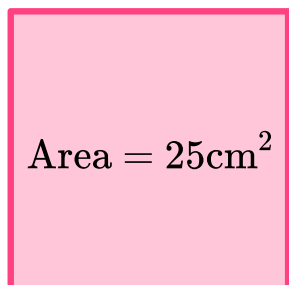
B) 39.4 cm Student divided by the sum of 8 and 6 rather than the product

C) 23 cm Student halved the product of 8 and 6 before dividing the volume

D) 11.5 cm Correct answer

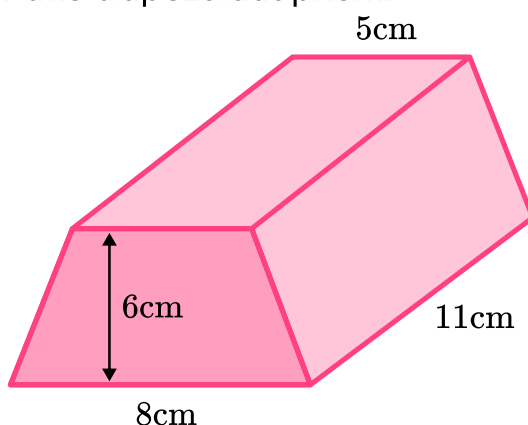
Diagnostic Questions: Volume & Surface Area Answers

5. The area of one face of a cube is 25 cm^2 . Find the volume of the cube.



- A) 150 cm^3 Student found the surface area (multiplying area by six)
 B) 125 cm^3 Correct answer
 C) 625 cm^3 Student squared the area
 D) 244 cm^3 Student divided 25 by 4, rather than square rooting, then cubed

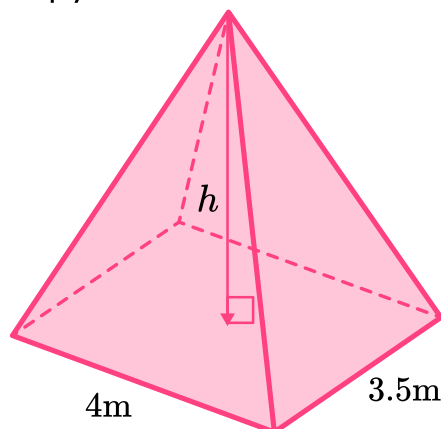
6. Calculate the volume of this trapezoidal prism:



- A) 528 cm^3 Student calculated the cross section area as rectangle 6×8
 B) 264 cm^3 Student worked out the cross section area incorrectly
 C) 2640 cm^3 Student found the product of all four lengths given
 D) 429 cm^3 Correct answer

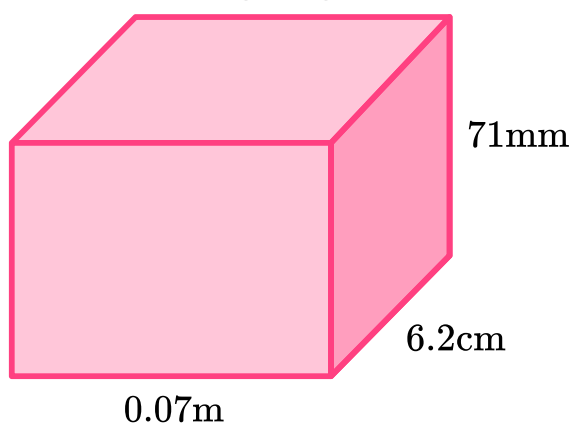
Diagnostic Questions: Volume & Surface Area Answers

7. Calculate the volume of this pyramid when $h = 6\text{m}$:



- A) 84 m^3 Student forgot to multiply by one third
- B) 42 m^3 Student multiplied by one half instead of one third
- C) 28 m^3 Correct answer
- D) 14 m^3 Student found the base area only

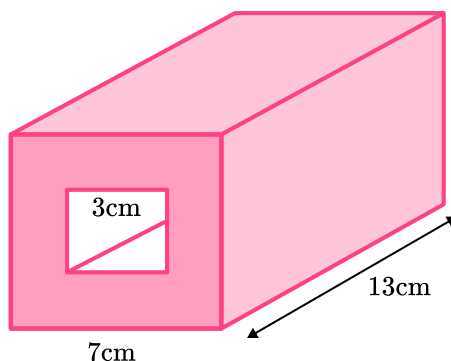
8. Calculate the volume of this cuboid giving your answer in cm^3 :



- A) 30.814 cm^3 Student multiplied lengths without converting units
- B) 308.14 cm^3 Correct answer
- C) 77.27 cm^3 Student added the numbers without understanding the problem
- D) 3081.4 cm^3 Student did not convert units correctly

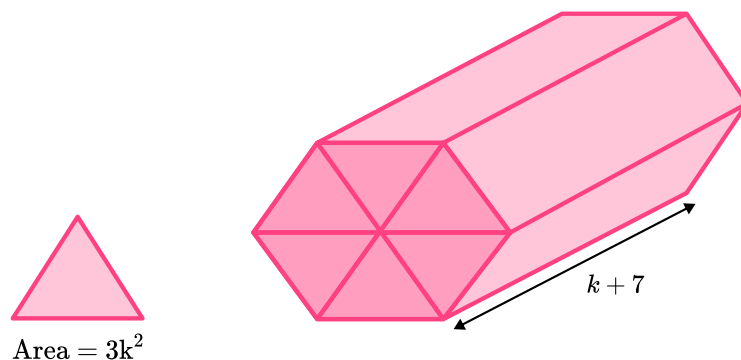
Diagnostic Questions: Volume & Surface Area Answers

9. The cross-section of this prism is formed by removing a square of side length 3 cm from a square of side length 7 cm . Find the volume of the prism:



- A) 520 cm^3 Correct answer
 B) 637 cm^3 Student forgot to remove the volume for the inner section
 C) 754 cm^3 Student added, rather than removing, the volume for the inner section
 D) 273 cm^3 Student found the product of 3, 7 and 13 without considering the problem

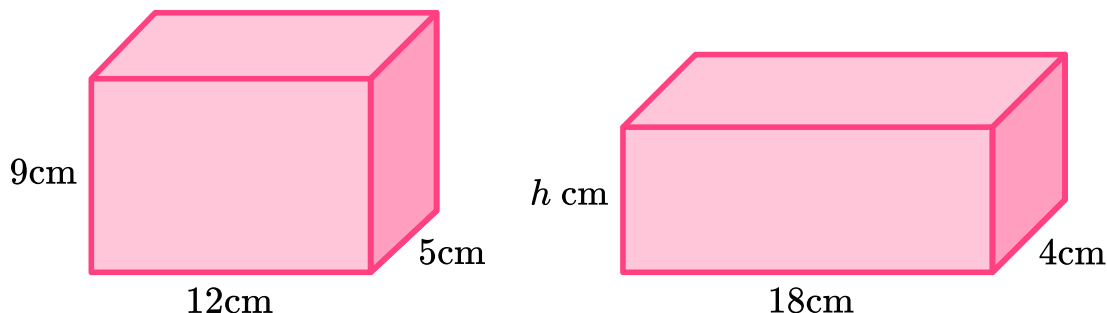
10. This prism has a cross-section formed from congruent triangles as shown. Derive an expression in expanded form for the volume of the prism.



- A) $3k^3 + 21k^2$ Student found the volume using one sixth of the cross-section
 B) $18k^3 + 7$ Student made errors multiplying expressions
 C) $18k^2 + k + 7$ Student found the sum, not the product, of expressions
 D) $18k^3 + 126k^2$ Correct answer

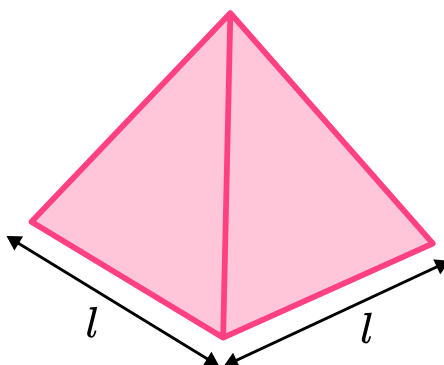
Diagnostic Questions: Volume & Surface Area Answers

11. Both cuboids have the same volume. Determine length h .



- A) 30 *cm* Student divided volume by 18 (rather than 18×4)
- B) 4 *cm* Student used addition / subtraction, not multiplication / division
- C) 7.5 *cm* Correct answer
- D) 120 *cm* Student inverted operations incorrectly ($540 \div (18 \div 4)$)

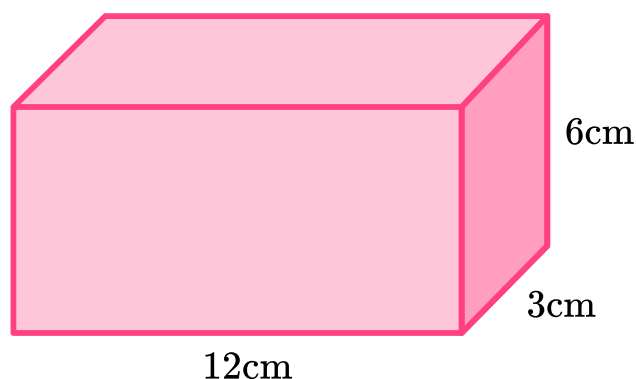
12. A square-based pyramid has height 8.5 *cm* and volume 102 *cm*³. Determine length l .



- A) 36 *cm* Student forgot to square root the base area
- B) 6 *cm* Correct answer
- C) $2\sqrt{3}$ *cm* Student forgot to multiply through by 3
- D) 2 *cm* Student inverted operations incorrectly

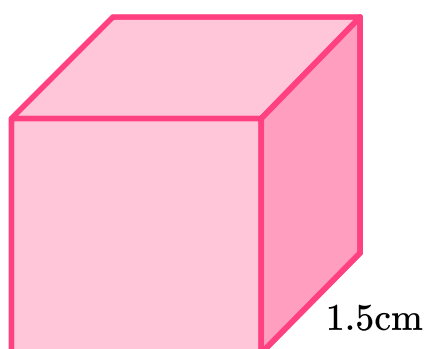
Diagnostic Questions: Volume & Surface Area Answers

13. Determine the surface area of the cuboid:



- A) 216 cm^2 Student confused methods for volume and surface area
- B) 126 cm^2 Student calculated the combined area of the visible faces
- C) 252 cm^2 Correct answer
- D) 84 cm^2 Student found the total of all the edge lengths

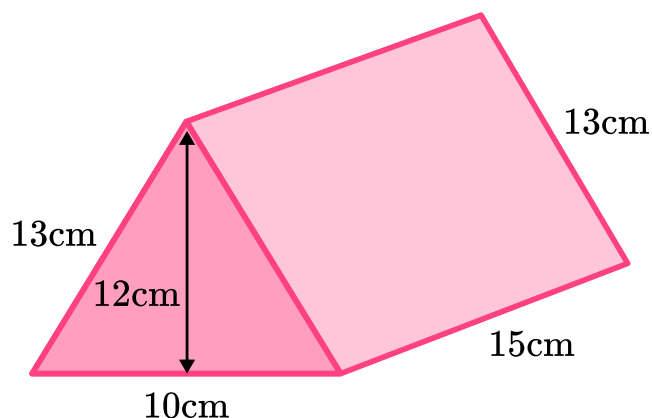
14. Calculate the surface area of this cube, giving your answer in mm^2 .



- A) 13.5 mm^2 Student forgot to convert units
- B) 135 mm^2 Student converted units using wrong scale factor
- C) 225 mm^2 Student found the area of one face only
- D) 1350 mm^2 Correct answer

Diagnostic Questions: Volume & Surface Area Answers

15. Find the surface area of this triangular prism:



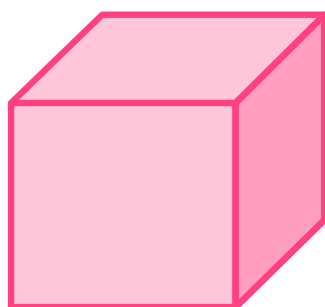
A) 660 cm^2 Correct answer

B) 780 cm^2 Student forgot to half the triangular areas

C) 255 cm^2 Student found the combined area of the two visible faces

D) 900 cm^2 Student confused volume and surface area methods

16. Given that the volume of this cube is 343 cm^3 , work out the surface area of the cube:



$$\text{Volume} = 343 \text{ cm}^3$$

A) 49 cm^2 Student worked out the area of one face only

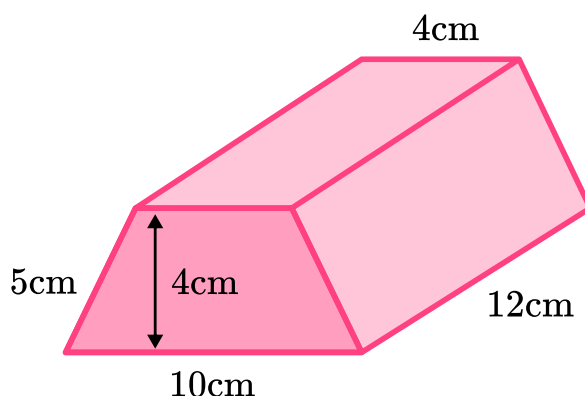
B) 7 cm^2 Student worked out the length of one edge

C) 147 cm^2 Student calculated the area of the three visible faces

D) 294 cm^2 Correct answer

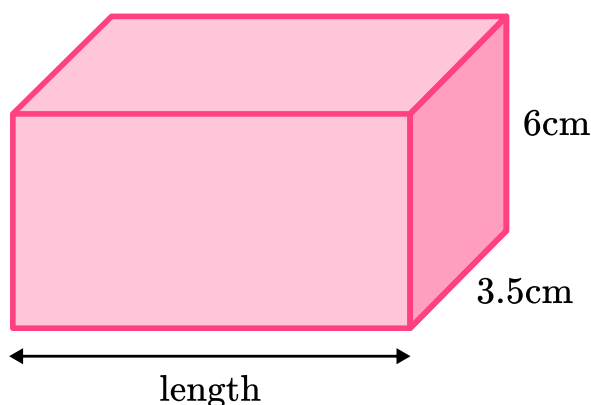
Diagnostic Questions: Volume & Surface Area Answers

17. The cross-section of this prism is an isosceles trapezium.
Calculate the surface area of the prism.



- A) 344 cm^2 Correct answer
 B) 400 cm^2 Student calculated the area of the trapezia incorrectly
 C) 336 cm^2 Student confused volume and surface area
 D) 136 cm^2 Student used only the three visible faces in the calculation

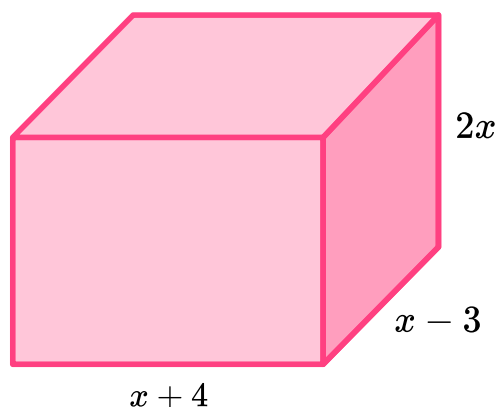
18. The surface area of this cuboid is 194 cm^2 . Work out the volume of the cuboid.



- A) 189 cm^3 Student found the missing length to be 9 cm
 B) 231 cm^3 Student found the missing length to be 11 cm
 C) 184.5 cm^3 Student subtracted the two given lengths from the surface area
 D) 168 cm^3 Correct answer

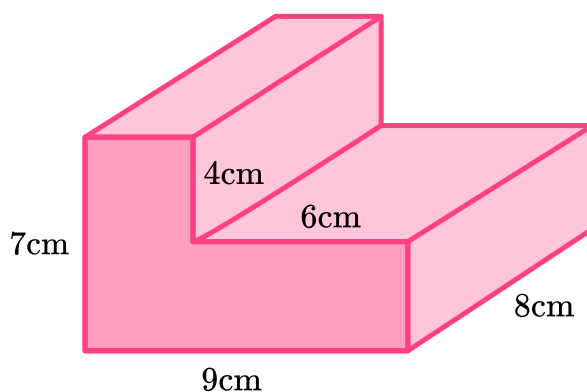
Diagnostic Questions: Volume & Surface Area Answers

19. Derive an expression for the surface area of this cuboid:



- A) $2x^3 + 2x^2 - 24x$ Student obtained an expression for the volume
 B) $10x^2 + 6x - 24$ **Correct answer**
 C) $5x^2 + 3x - 12$ Student found the combined area of the visible faces
 D) $4x + 1$ Student found the sum of the three given edge lengths

20. Calculate the surface area of the prism:



- A) 167 cm^2 Student found the surface area of the visible faces
 B) 334 cm^2 **Correct answer**
 C) 312 cm^2 Student confused volume and surface area
 D) 295 cm^2 Student included the cross-section area once only

Where to go next?

For more ^x diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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