4.13 Volume of a Prism: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Formulae You May Need

Revision Library formulae reminder, styled on Edexcel 1MA1 formulae-sheet conventions; wording is original.

Volume of a prism = area of cross section x length

Area of a trapezium = (1/2) x (a + b) x h

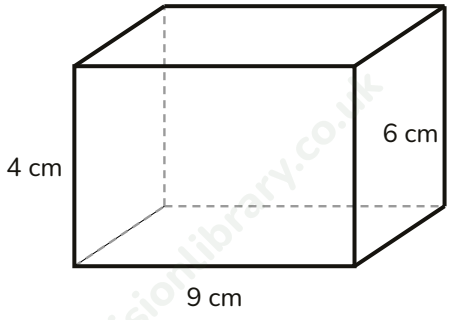
Note: on the Edexcel formulae sheet, both of these formulae are given to you (foundation and higher tiers). You still need to recall the area of a rectangle (A = l x w), the area of a triangle (A = (1/2) x b x h) and the area of a parallelogram (A = b x h) yourself - these are not given.

1 litre = 1000 cm^3

1 m^3 = 1,000,000 cm^3 (since 1 m = 100 cm, and 100^3 = 1,000,000)

1 A cuboid has length 9 cm, width 6 cm and height 4 cm. Work out the volume of the cuboid.

Diagram NOT accurately drawn

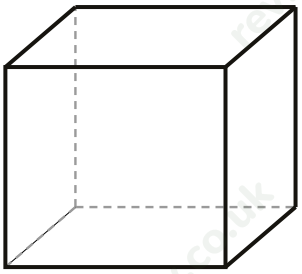


(Total for Question 1 is 2 marks)

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2 A cube has edge length 9 cm. Work out the volume of the cube.

Diagram NOT accurately drawn

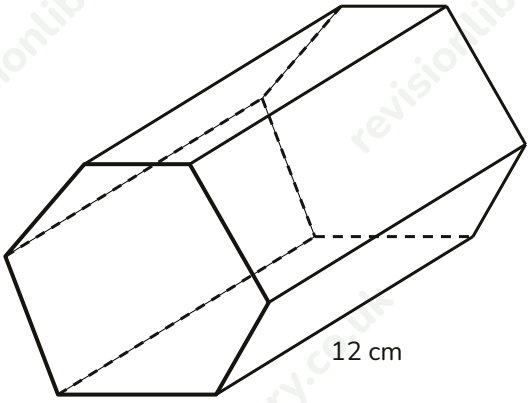


(Total for Question 2 is 2 marks)

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3 The cross-section of a prism is an irregular hexagon with area 18.5 cm². The prism has length 12 cm. Work out the volume of the prism.

Diagram NOT accurately drawn



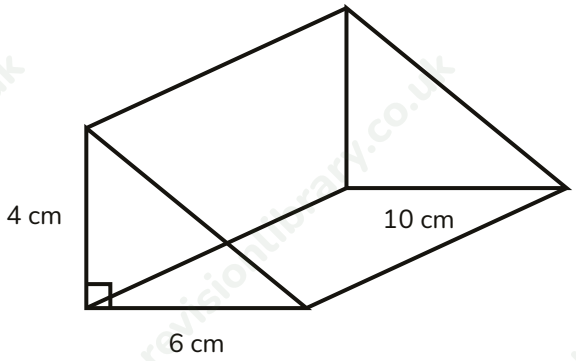
Cross-section area: 18.5 cm²

(Total for Question 3 is 2 marks)

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4 A prism has a cross-section that is a right-angled triangle with base 6 cm and height 4 cm. The length of the prism is 10 cm.
Work out the volume of the prism.

Diagram NOT accurately drawn

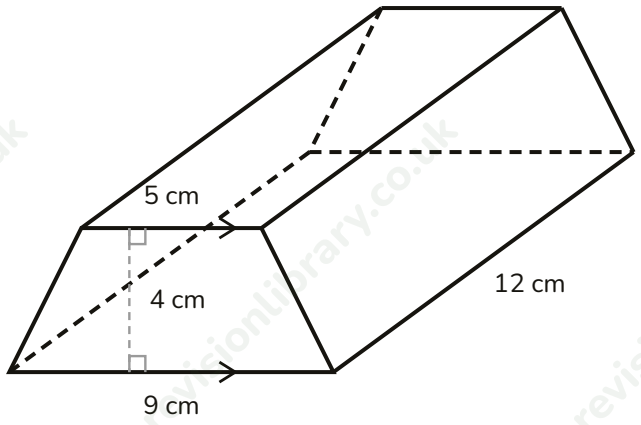


(Total for Question 4 is 3 marks)

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5 The cross-section of a prism is a trapezium with parallel sides of length 5 cm and 9 cm. The perpendicular distance between the parallel sides is 4 cm. The prism is 12 cm long.
Work out the volume of the prism.

Diagram NOT accurately drawn



Not drawn accurately

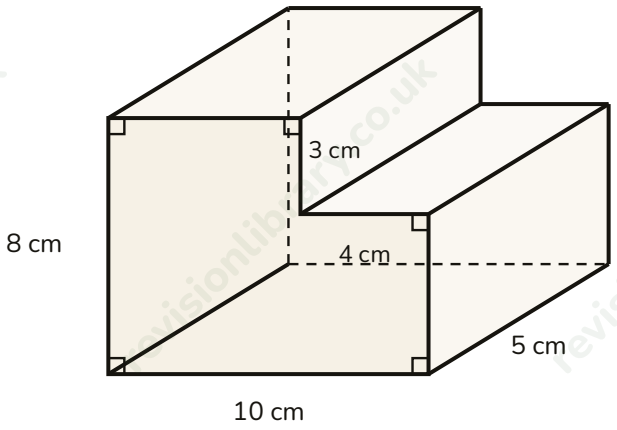
(Total for Question 5 is 3 marks)

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6 The cross-section of a prism is an L-shape. The L-shape is made from a rectangle measuring 10 cm by 8 cm with a smaller rectangle measuring 4 cm by 3 cm cut from one corner. The prism is 5 cm long.

Work out the volume of the prism.

Diagram NOT accurately drawn

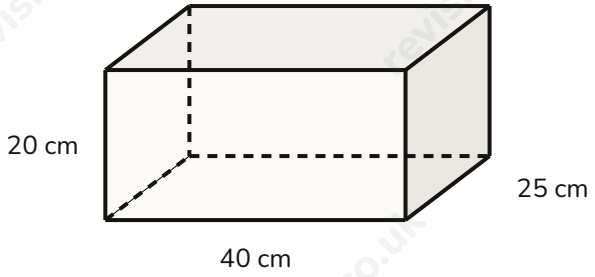


(Total for Question 6 is 4 marks)

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7 A fish tank is a cuboid with internal dimensions 40 cm by 25 cm by 20 cm.
Work out the volume of the tank. Give your answer in litres. (1 litre = 1000 cm^3)

Diagram NOT accurately drawn

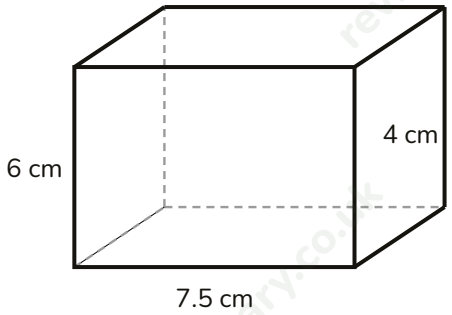


(Total for Question 7 is 4 marks)

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8 A cuboid has length 7.5 cm, width 4 cm and height 6 cm. Work out the volume of the cuboid.

Diagram NOT accurately drawn

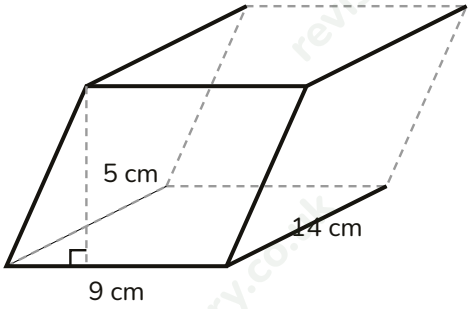


(Total for Question 8 is 2 marks)

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9 A prism has a cross-section in the shape of a parallelogram. The parallelogram has base 9 cm and perpendicular height 5 cm. The prism has length 14 cm. Calculate the volume of the prism.

Diagram NOT accurately drawn

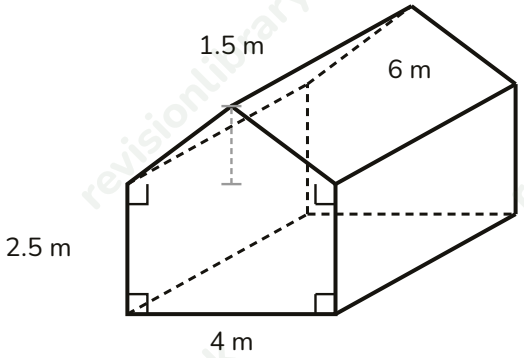


(Total for Question 9 is 3 marks)

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10 A garden storage shed is modelled as a triangular prism roof on top of a cuboid.
The cuboid part has length 6 m, width 4 m and height 2.5 m.
The triangular prism roof has the same length as the cuboid (6 m). The triangular cross-section of the roof has a base of 4 m and a height of 1.5 m.
Work out the total volume of the shed.

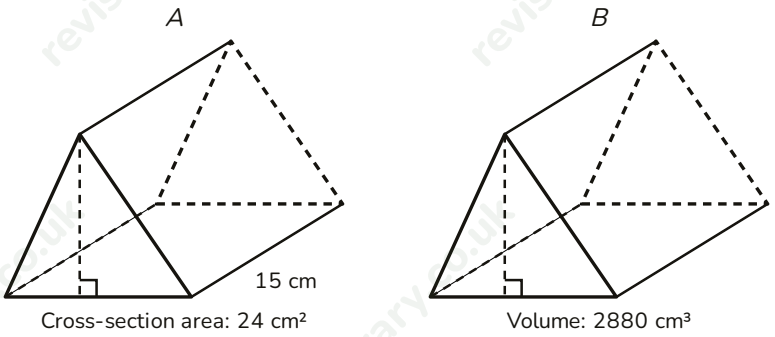
Diagram NOT accurately drawn



(Total for Question 10 is 5 marks)

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11 Two similar triangular prisms A and B have corresponding linear dimensions in the ratio 1 : k. Prism A has cross-sectional area 24 cm² and length 15 cm. The volume of prism B is 2880 cm³. Find the scale factor k and the cross-sectional area of prism B.

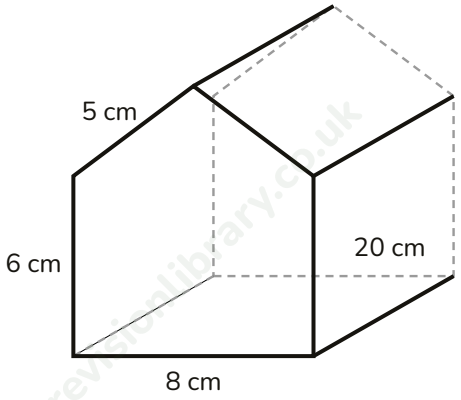


(Total for Question 11 is 5 marks)

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12 A solid prism has length 20 cm. Its cross-section (shown in the diagram) is a pentagon made from a rectangle with a triangle on top, like the end of a house shape. The rectangular part has width 8 cm and height 6 cm. The triangular part on top has a horizontal base of 8 cm (the same as the rectangle's width), and each of its two sloping sides has length 5 cm.

Diagram NOT accurately drawn



(a) Show that the perpendicular height of the triangular part of the cross-section is 3 cm. **(3)**

(b) Work out the total volume of the solid prism. **(4)**

(c) The solid prism is melted down and recast, with no wastage, into identical small cubes of edge length 2 cm. Work out how many complete small cubes can be made. **(3)**

(Total for Question 12 is 10 marks)

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Mark scheme · 4.13 Volume of a Prism: 1-hour Pack

Question 1

correct substitution into V = l x w x h, e.g. 9 x 6 x 4 (oe)	**M1**
216 cm³ (cao)	**A1**

Answer: 216 cm^3

Question 2

correct substitution into V = l^3, e.g. 9^3 (oe)	**M1**
729 cm³ (cao)	**A1**

Answer: 729 cm^3

Question 3

correct substitution into V = area of cross section x length, e.g. 18.5 x 12 (oe)	**M1**
222 cm³ (cao)	**A1**

Answer: 222 cm^3

Question 4

area of triangle = 0.5 x 6 x 4 (= 12) oe	**M1**
volume = 12 x 10 ft (their area x 10)	**M1**
120 cao (units cm^3)	**A1**

Answer: 120 cm^3

Question 5

0.5 x (5 + 9) x 4 (= 28) oe	**M1**
28 x 12 ft (their area x 12)	**M1**
336 cao (units cm^3)	**A1**

Answer: 336 cm^3

Question 6

10 x 8 (= 80) oe	**M1**
4 x 3 (= 12) oe	**M1**
(80 - 12) x 5 ft (= 340)	**M1**
340 cao (units cm^3)	**A1**

Answer: 340 cm^3

Question 7

40 x 25 x 20 oe	**M1**
20000 cao (units cm^3)	**A1**
20000 / 1000 ft (their volume divided by 1000)	**M1**
20 litres cao	**A1**

Answer: 20 litres (20000 cm^3)

Question 8

correct substitution into V = l x w x h, e.g. 7.5 x 4 x 6 (oe)	**M1**
180 cm³ (cao)	**A1**

Answer: 180 cm^3

Question 9

area of parallelogram = 9 x 5 (oe), = 45 cm²	**M1**
correct substitution into V = area of cross section x length, e.g. 45 x 14 (oe, ft their area)	**M1**
630 cm³ (cao)	**A1**

Answer: 630 cm^3

Question 10

6 x 4 x 2.5 (= 60) oe (cuboid volume)	**M1**
0.5 x 4 x 1.5 (= 3) oe (triangle area)	**M1**
3 x 6 ft (= 18, roof volume)	**M1**
60 + 18 ft (total volume)	**M1**
78 cao (units m^3)	**A1**

Answer: 78 m^3

Question 11

Use similarity: areas scale as k^2 and lengths scale as k, so volumes scale as k^3	**M1**
Volume of A = $area_A$ * $length_A$ = 24 * 15 = 360 cm³; set up 360 * k^3 = 2880	**M1**
Solve k^3 = 2880 / 360 = 8, so k = 2	**M1**
Find $area_B$ = $area_A$ * k^2 = 24 * 4 = 96 cm²	**M1**
k = 2 and cross-sectional area = 96 cm² cao	**A1**

Answer: k = 2, area of prism B = 96 cm^2

Question 12

(a) identifies the triangle as isosceles and uses half the base, e.g. half of 8 = 4 cm	**M1**
(a) correct use of Pythagoras, e.g. height = $\sqrt{5^2 - 4^2}$ (oe)	**M1**
(a) height = 3 cm fully shown with no errors (cso)	**A1**

(a) Answer: 3 cm (shown)

(b) area of rectangle = 8 x 6 (oe), = 48 cm²	**M1**
(b) area of triangle = (1/2) x 8 x 3 (oe, ft their height from part (a)), = 12 cm²	**M1**
(b) total cross-sectional area = 48 + 12 = 60 cm², then x length, e.g. 60 x 20 (oe, ft)	**M1**
(b) 1200 cm³ (cao)	**A1**

(b) Answer: 1200 cm^3

(c) volume of one small cube = 2^3 (oe), = 8 cm³	**M1**
(c) 1200 / 8 (oe, ft their volume from part (b) and cube volume)	**M1**
(c) 150 cubes (cao)	**A1**

(c) Answer: 150 cubes

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