4.20 3D Shapes, Plans and Elevations: 30-minute Pack

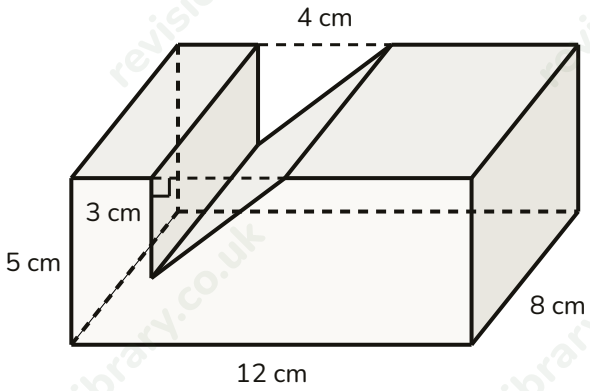
Calculators not allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A model is made from a cuboid 12 cm by 8 cm by 5 cm with a triangular prism cut out along its length. The triangular prism removed has right triangle cross-section with legs 3 cm and 4 cm and length 8 cm. Calculate the volume of the remaining solid.

Diagram NOT accurately drawn



(3)

2 State how many faces, edges and vertices a rectangular prism (cuboid) has.

(2)

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3 Write down the number of faces, edges and vertices of a triangular-based pyramid.

(2)

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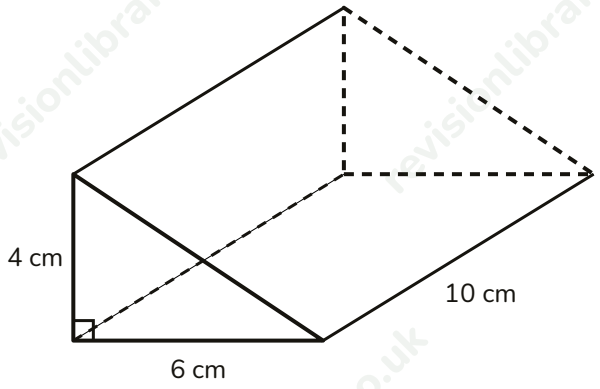
4 A solid is built from cubes. The number of cubes in each stack is given as a grid, with 2 rows and 4 columns. Rows are ordered from front to back, and entries in each row run from left to right. row 1 (left to right): 1, 1, 0, 2; row 2 (left to right): 0, 0, 3, 3.
How many squares does the front elevation (viewed from the front of row 1) show?

(3)

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5 A triangular prism has a right-angled triangle for its cross-section, with base 6 cm and height 4 cm. The prism is 10 cm long. Work out its volume.

Diagram NOT accurately drawn



(3)

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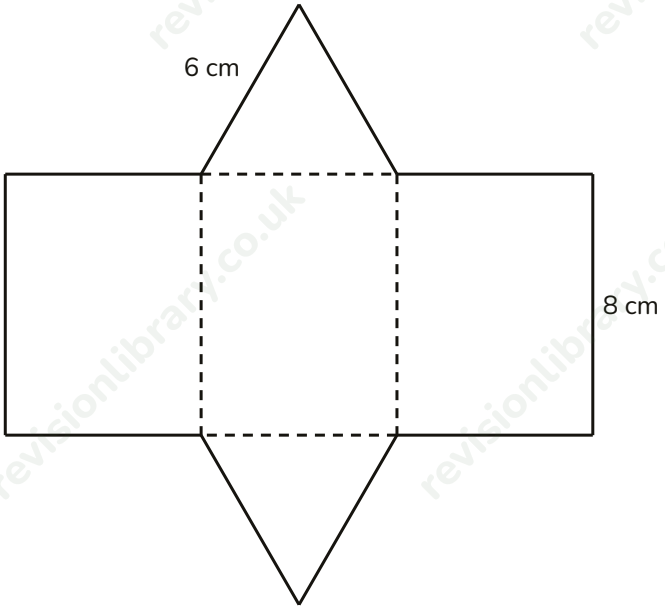
6 A solid is built from cubes. The number of cubes in each stack is given as a grid, with 3 rows and 3 columns. row 1 (front to back): 2, 0, 0; row 2 (front to back): 3, 0, 1; row 3 (front to back): 3, 2, 3.
How many cubes are used altogether?

(2)

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7 A net is shown for a triangular prism made from two equilateral triangular faces and three rectangular faces. The triangular face has side 6 cm and each rectangle has height 8 cm. Calculate the total surface area of the prism.

Diagram NOT accurately drawn



(3)

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8 A solid has 5 faces and 6 vertices. Use Euler's formula, F + V - E = 2, to work out the number of edges.

(2)

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9 Draw the front elevation and a top plan for a cuboid with a small square hole cut through the centre from the top to the bottom. The cuboid measures 8 cm by 5 cm by 3 cm (length by width by height). The hole is a square of side 1 cm centred on the top face. Describe the shapes seen in the front elevation and top plan.

(2)

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10 Identify the net of a tetrahedron (triangular-based pyramid) from these descriptions and give a reason: (i) four squares attached in a strip, (ii) one triangle with three rectangles attached, (iii) one triangle with three triangles attached.

(2)

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Mark scheme · 4.20 3D Shapes, Plans and Elevations: 30-minute Pack

Question 1

calculates volume of cuboid = 12 x 8 x 5 = 480 cm³ or area of triangular cross-section = 1/2 x 3 x 4 = 6	M1
calculates volume removed = 6 x 8 = 48 cm³	M1
volume remaining = 480 - 48 = 432 cm³ cao	A1

Answer: **432 cm^3**

Question 2

identification of two of the three values correctly eg faces = 6 and edges = 12 or edges = 12 and vertices = 8	M1
all three correct: faces = 6, edges = 12, vertices = 8 cao	A1

Answer: **Faces = 6, Edges = 12, Vertices = 8**

Question 3

two of the three numbers correct	M1
4 faces, 6 edges, 4 vertices cao	A1

Answer: **4 faces, 6 edges, 4 vertices**

Question 4

uses the tallest stack in each column	M1
adds the column heights	M1
8 cao	A1

Answer: **8**

Question 5

cross-section area 1/2 x 6 x 4	M1
x 10	M1
120 cm³ cao	A1

Answer: **120 cm^3**

Question 6

adds the stacks	M1
14 cao	A1

Answer: **14**

Question 7

area of two equilateral triangles found or area of three rectangles found	M1
area values combined correctly	M1
total surface area = $144 + 18\sqrt{3}$ cm^2, approximately 175.2 cm² cao	A1

Answer: **$144 + 18\sqrt{3}$ cm^2 (approx 175.2 cm^2)**

Question 8

5 + 6 - E = 2 or E = 5 + 6 - 2	M1
9 cao	A1

Answer: **9**

Question 9

identifies front elevation shows an 8 cm by 3 cm rectangle	M1
identifies top plan shows an 8 cm by 5 cm rectangle with a central 1 cm square hole cao	A1

Answer: **Front elevation: an 8 cm by 3 cm rectangle (no hole visible from the front); Top plan: an 8 cm by 5 cm rectangle with a central 1 cm square hole**

Question 10

chooses (iii) as the correct net	B1
gives reason that a tetrahedron has four triangular faces meeting at a point (oe)	B1

Answer: **(iii) because a tetrahedron is made entirely of four triangular faces**

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