4.20 3D Shapes, Plans and Elevations: 1-hour Pack

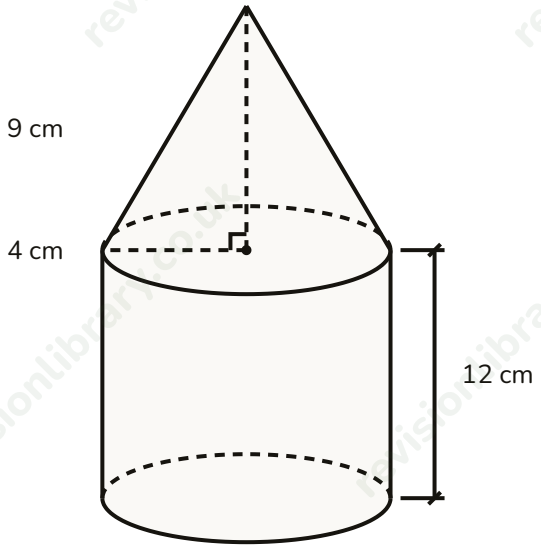
Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A solid consists of a right circular cone of height 9 cm and base radius 4 cm sitting on top of a cylinder of height 12 cm and same base radius. Calculate the total surface area excluding the base of the cylinder that sits on the table (include the curved surfaces and the top of the cone). Give your answer in cm^2. Use π as π.

Diagram NOT accurately drawn

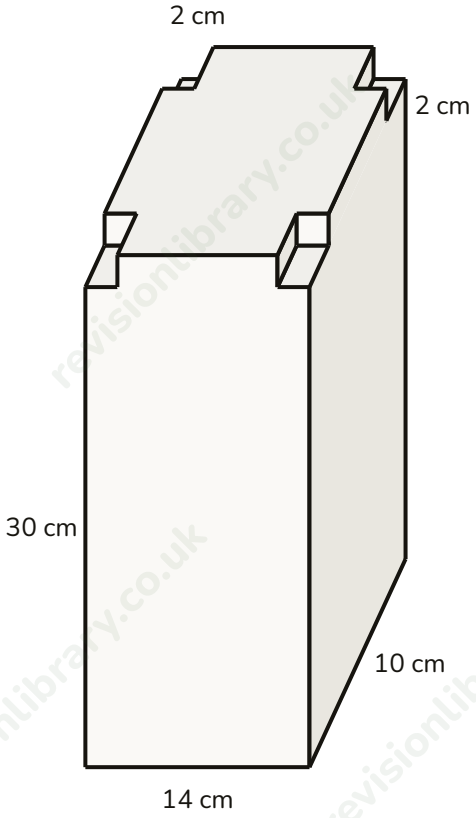


(4)

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2 A castle model has a rectangular tower 14 cm by 10 cm base and height 30 cm. On top of the tower sits a crenelated parapet formed by removing four equal square prisms of side 2 cm from the corners of a thin slab of thickness 2 cm. Calculate the surface area added to the tower by the parapet (that is, the increase in the total surface area of the model; the slab has the same 14 cm by 10 cm base as the tower).

Diagram NOT accurately drawn



(3)

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

(3)

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4 A solid has 12 edges and 8 vertices. Work out the number of faces.

(2)

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5 Write down the number of faces, edges and vertices of a hexagonal prism.

(2)

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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, 2, 1; row 2 (front to back): 1, 1, 0; row 3 (front to back): 2, 0, 0.
How many squares does the plan view (from above) of the solid show?

(2)

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7 A cylinder has height 10 cm and base radius 3 cm. State how many curved faces, flat faces and edges it has.

(2)

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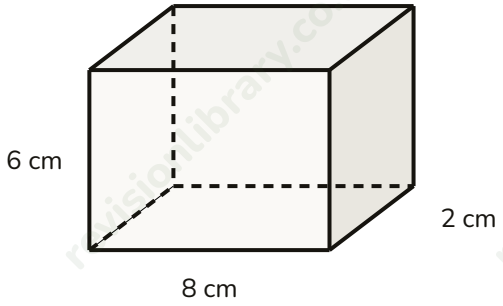
8 Write down the number of faces, edges and vertices of a tetrahedron.

(2)

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9 A cuboid measures 8 cm by 2 cm by 6 cm. Work out its total surface area.

Diagram NOT accurately drawn

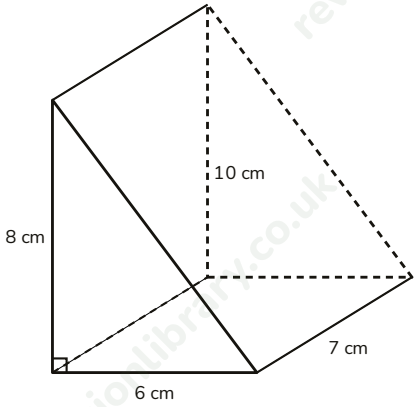


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10 A triangular prism has a right-angled triangle as its cross-section. The triangle has sides 6 cm, 8 cm and 10 cm (the longest side is 10 cm). The prism is 7 cm long. Work out the total surface area.

Diagram NOT accurately drawn



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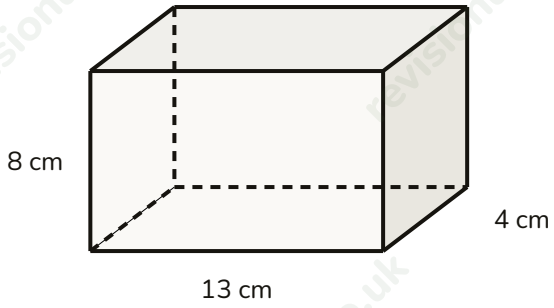
11 A solid has 6 edges and 4 vertices. Work out the number of faces.

(2)

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12 A cuboid measures 13 cm by 4 cm by 8 cm. Work out its volume.

Diagram NOT accurately drawn

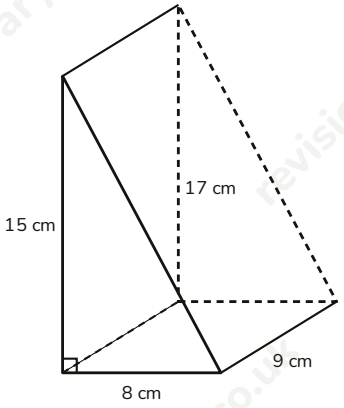


(2)

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13 A triangular prism has a right-angled triangle as its cross-section. The triangle has sides 8 cm, 15 cm and 17 cm (the longest side is 17 cm). The prism is 9 cm long. Work out the total surface area.

Diagram NOT accurately drawn



(4)

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14 Write down the number of faces, edges and vertices of a cube.

(2)

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15 A solid is built from cubes. The number of cubes in each stack is given as a grid, with 2 rows and 4 columns. row 1 (front to back): 2, 0, 2, 3; row 2 (front to back): 1, 3, 3, 1.
How many squares does the plan view (from above) of the solid show?

(2)

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16 A solid is built from cubes. The number of cubes in each stack is given as a grid, with 3 rows and 4 columns. row 1 (front to back): 2, 2, 3, 3; row 2 (front to back): 1, 0, 1, 2; row 3 (front to back): 2, 3, 0, 0.
How many squares does the plan view (from above) of the solid show?

(2)

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17 A solid is built from cubes. The number of cubes in each stack is given as a grid, with 3 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): 2, 2, 0, 1; row 2 (left to right): 0, 3, 2, 2; row 3 (left to right): 0, 3, 0, 1.

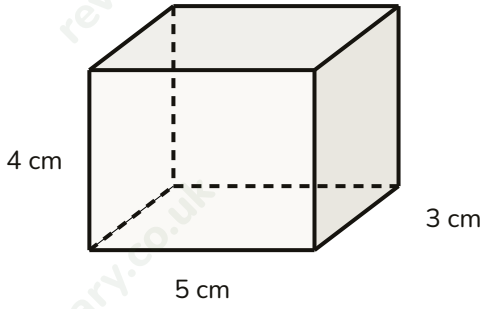
How many squares does the front elevation (viewed from the front of row 1) show?

(3)

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18 A cuboid measures 5 cm by 3 cm by 4 cm. Work out its total surface area.

Diagram NOT accurately drawn



(3)

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Mark scheme · 4.20 3D Shapes, Plans and Elevations: 1-hour Pack

Question 1

finds curved surface area of cylinder = $2\pi r h = 2\pi \times 4 \times 12 = 96\pi$	M1
finds slant height of cone correctly: $l = \sqrt{9^2 + 4^2} = \sqrt{97}$	M1
finds curved surface area of cone = $\pi r l = \pi \times 4 \times \sqrt{97}$ correctly	M1
adds areas: total = $96\pi + 4\pi\sqrt{97}$ (cao) written as $(96 + 4\sqrt{97})\pi$ cm^2	A1

Answer: **$(96 + 4\sqrt{97})\pi$ cm^2**

Question 2

calculates area of top slab before cuts = 14 x 10 = 140 and area removed by four corner squares = $4 \times 2^2 = 16$, so exposed top of parapet = 124	M1
calculates exposed vertical wall area of the parapet: each corner notch removes as much edge length as it adds, so the perimeter is unchanged at 2 x (14+10) = 48 cm, giving wall area = 48 x 2 = 96 cm²	M1
recognises that the 124 cm² of exposed slab top exactly replaces the 124 cm² of tower top it now covers, and the 16 cm² of tower top seen through the notches was already exposed, so only the walls add area: final added surface area = 96 cm² cao	A1

Answer: **96 cm^2**

Question 3

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

Answer: **10**

Question 4

F + 8 - 12 = 2	M1
6 cao	A1

Answer: **6**

Question 5

two of the three numbers correct	M1
8 faces, 18 edges, 12 vertices cao	A1

Answer: **8 faces, 18 edges, 12 vertices**

Question 6

counts the stacks that contain at least one cube	M1
6 cao	A1

Answer: **6**

Question 7

identifies two categories correctly (eg curved face = 1 and flat faces = 2)	M1
all three correct: 1 curved face, 2 flat faces, 2 edges cao	A1

Answer: **Curved faces = 1, Flat faces = 2, Edges = 2**

Question 8

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

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

Question 9

area of at least two different faces found	M1
all three pairs of faces: 2(16) + 2(48) + 2(12)	M1
152 cm² cao	A1

Answer: **152 cm^2**

Question 10

two triangles: 2 x 1/2 x 6 x 8 = 48	M1
perimeter of triangle x length: 24 x 7	M1
adds the triangles and the rectangles	M1
216 cm² cao	A1

Answer: **216 cm^2**

Question 11

F + 4 - 6 = 2	M1
4 cao	A1

Answer: **4**

Question 12

13 x 4 x 8	M1
416 cm³ cao	A1

Answer: **416 cm^3**

Question 13

two triangles: 2 x 1/2 x 8 x 15 = 120	M1
perimeter of triangle x length: 40 x 9	M1
adds the triangles and the rectangles	M1
480 cm² cao	A1

Answer: **480 cm^2**

Question 14

two of the three numbers correct	M1
6 faces, 12 edges, 8 vertices cao	A1

Answer: **6 faces, 12 edges, 8 vertices**

Question 15

counts the stacks that contain at least one cube	M1
7 cao	A1

Answer: **7**

Question 16

counts the stacks that contain at least one cube	M1
9 cao	A1

Answer: **9**

Question 17

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

Answer: **9**

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Question 18

area of at least two different faces found	**M1**
all three pairs of faces: 2(15) + 2(20) + 2(12)	**M1**
94 cm² cao	**A1**

Answer: **94 cm^2**

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