4.12 Surface Area: 2-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 120 minutes

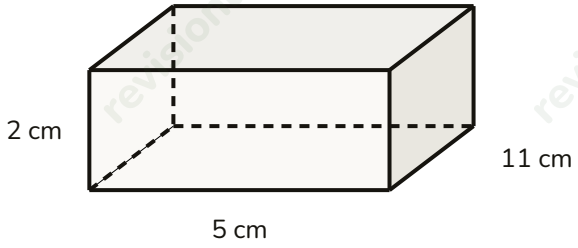
Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A cuboid has length 5 cm, width 11 cm and height 2 cm.
Work out the total surface area of the cuboid.

Diagram NOT accurately drawn

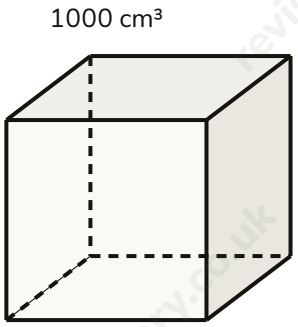


(Total for Question 1 is 3 marks)

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2 A cube has a volume of 1000 cm³.
Work out the total surface area of the cube.

Diagram NOT accurately drawn



(Total for Question 2 is 3 marks)

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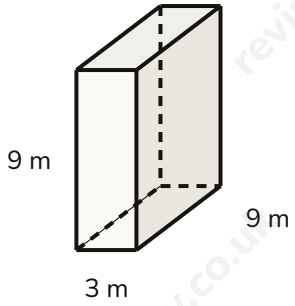
3 An open box has no lid. The base is 17 cm by 6 cm and the box is 4 cm high.
Work out the total outside surface area of the box (including the base).

(Total for Question 3 is 3 marks)

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4 A cuboid has length 3 m, width 9 m and height 9 m.
Work out the total surface area of the cuboid.

Diagram NOT accurately drawn

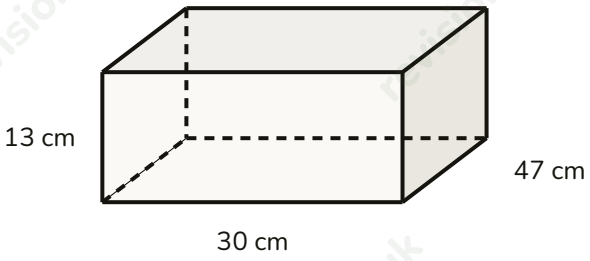


(Total for Question 4 is 3 marks)

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5 A closed wooden box is a cuboid 30 cm by 47 cm by 13 cm. All of the outside is painted. One tin of paint covers 1500 cm².
Work out the least number of tins of paint needed to paint the box.

Diagram NOT accurately drawn

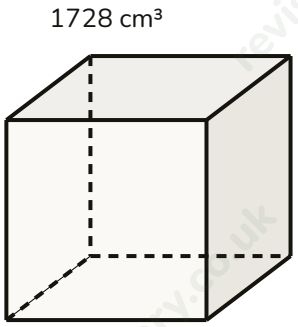


(Total for Question 5 is 4 marks)

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6 A cube has a volume of 1728 cm³.
Work out the total surface area of the cube.

Diagram NOT accurately drawn



(Total for Question 6 is 3 marks)

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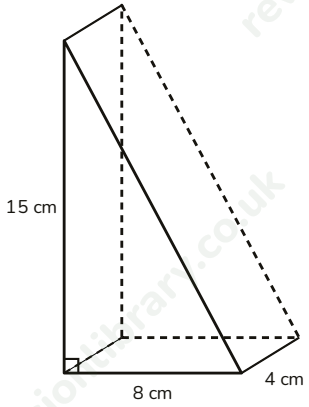
7 An open box has no lid. The base is 13 cm by 12 cm and the box is 4 cm high.
Work out the total outside surface area of the box (including the base).

(Total for Question 7 is 3 marks)

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8 A prism has a cross-section that is a right-angled triangle with perpendicular sides 8 cm and 15 cm. The length of the prism is 4 cm.
Work out the total surface area of the prism.

Diagram NOT accurately drawn

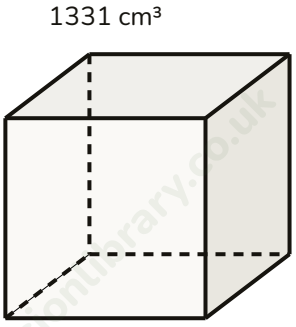


(Total for Question 8 is 4 marks)

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9 A cube has a volume of 1331 cm³.
Work out the total surface area of the cube.

Diagram NOT accurately drawn

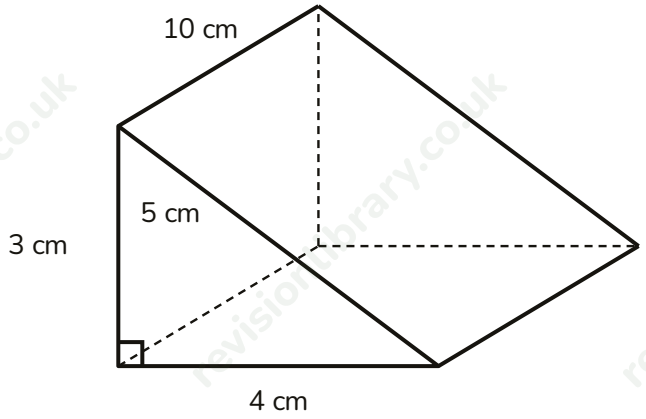


(Total for Question 9 is 3 marks)

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10 A triangular prism has a right-angled triangular cross-section with shorter sides 3 cm and 4 cm and hypotenuse 5 cm. The length of the prism is 10 cm. Work out the total surface area of the prism.

Diagram NOT accurately drawn

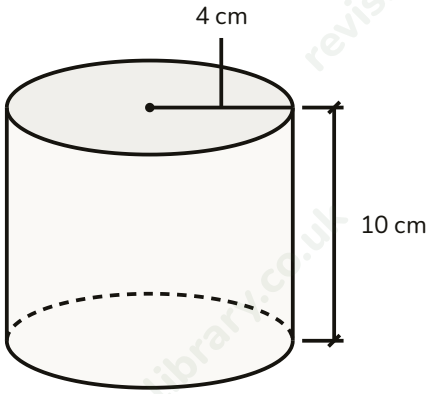


(Total for Question 10 is 4 marks)

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11 A closed cylinder has radius 4 cm and height 10 cm. Work out the total surface area of the cylinder. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

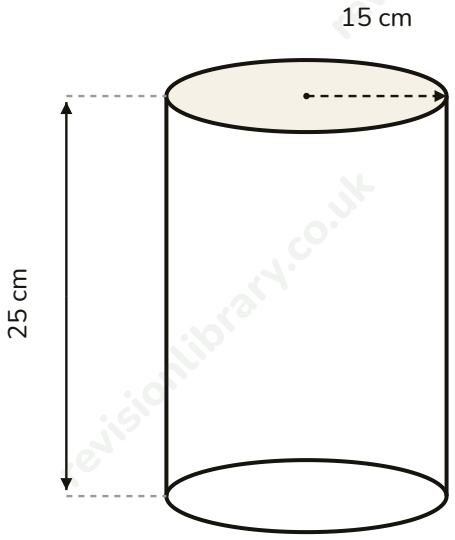


(Total for Question 11 is 3 marks)

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12 A cylindrical bucket, open at the top, has radius 15 cm and height 25 cm. Work out the total surface area of the bucket (curved surface and base only). Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

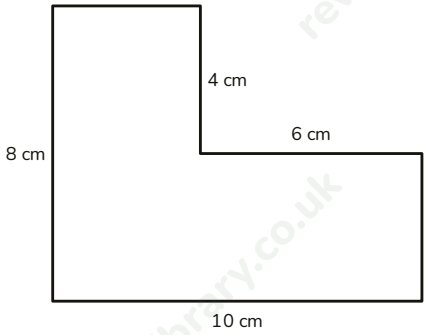


(Total for Question 12 is 3 marks)

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13 A solid is made from two cuboids joined to form an L-shaped prism. The L-shaped cross-section fits inside a 10 cm by 8 cm bounding rectangle, with a 6 cm by 4 cm rectangular corner removed. The prism has a length of 8 cm. Work out the total surface area of the solid.

Diagram NOT accurately drawn



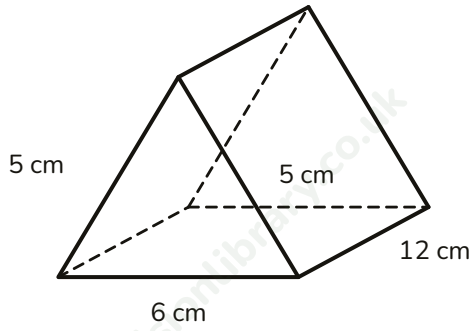
Prism length 8 cm

(Total for Question 13 is 5 marks)

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14 An isosceles triangular prism has a cross-section with base 6 cm and two equal sides of 5 cm. The prism has length 12 cm.

Diagram NOT accurately drawn



(a) Show that the perpendicular height of the triangular cross-section is 4 cm. **(2)**

(b) Work out the total surface area of the prism. **(3)**

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(Total for Question 14 is 5 marks)

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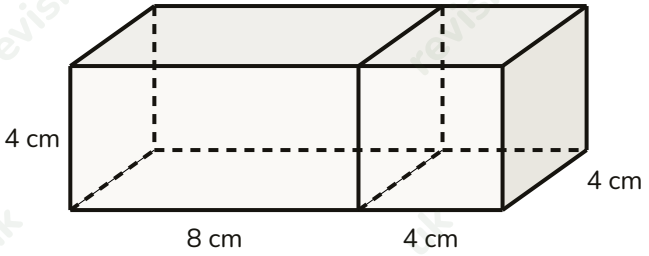
15 A block measures 600 mm by 200 mm by 100 mm. Calculate its surface area in square metres. Give your answer to 2 decimal places.

(Total for Question 15 is 2 marks)

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16 A cuboid of dimensions 8 cm by 4 cm by 4 cm is attached to a cube of side 4 cm so that the 4 cm by 4 cm faces are exactly joined. Work out the surface area of the composite solid.

Diagram NOT accurately drawn

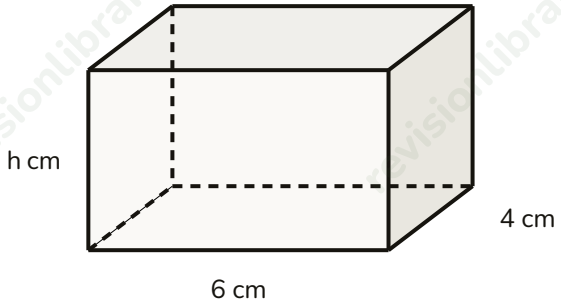


(Total for Question 16 is 3 marks)

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17 A rectangular prism has base 6 cm by 4 cm and height h cm. The total surface area is 188 cm^2. Work out h.

Diagram NOT accurately drawn

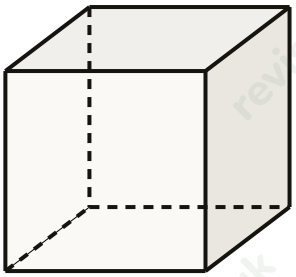


(Total for Question 17 is 3 marks)

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18 A cube has side length 7 cm. Work out the total surface area of the cube.

Diagram NOT accurately drawn



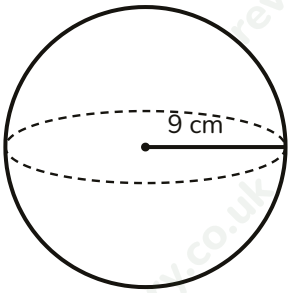
7 cm

(Total for Question 18 is 2 marks)

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19 A sphere has radius 9 cm. Work out the total surface area of the sphere. Give your answer correct to 3 significant figures. (You may use the formula $S = 4 \times \pi \times r^2$)

Diagram NOT accurately drawn

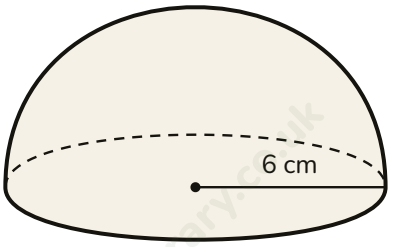


(Total for Question 19 is 2 marks)

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20 A solid hemisphere has radius 6 cm. Work out the total surface area of the hemisphere (curved surface plus the flat circular face). Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

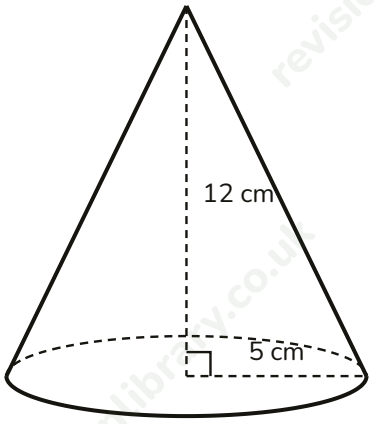


(Total for Question 20 is 3 marks)

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21 A cone has base radius 5 cm and perpendicular height 12 cm.

Diagram NOT accurately drawn



(a) Work out the slant height, l, of the cone. **(2)**

.....

(b) Work out the total surface area of the cone (curved surface plus base). Give your answer correct to 3 significant figures. (You may use the formula: curved surface area = π x r x l) **(3)**

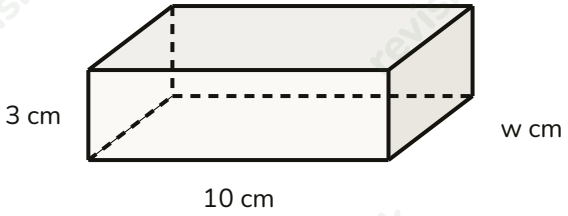
.....

(Total for Question 21 is 5 marks)

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22 A cuboid has length 10 cm, width w cm and height 3 cm. The surface area of the cuboid is 190 cm^2. Work out w.

Diagram NOT accurately drawn



(Total for Question 22 is 3 marks)

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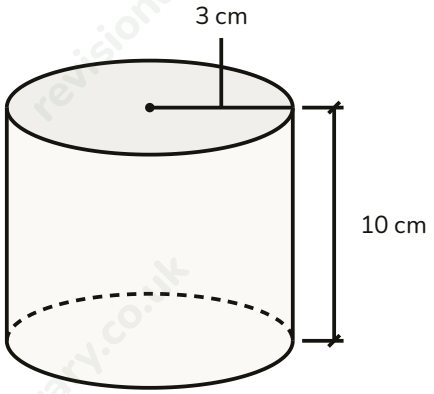
23 A closed rectangular box has exterior dimensions 12 cm by 8 cm by 5 cm. Calculate the surface area of the box.

(Total for Question 23 is 3 marks)

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24 A closed cylinder has radius 3 cm and height 10 cm. Work out the total surface area. Give your answer in terms of π.

Diagram NOT accurately drawn

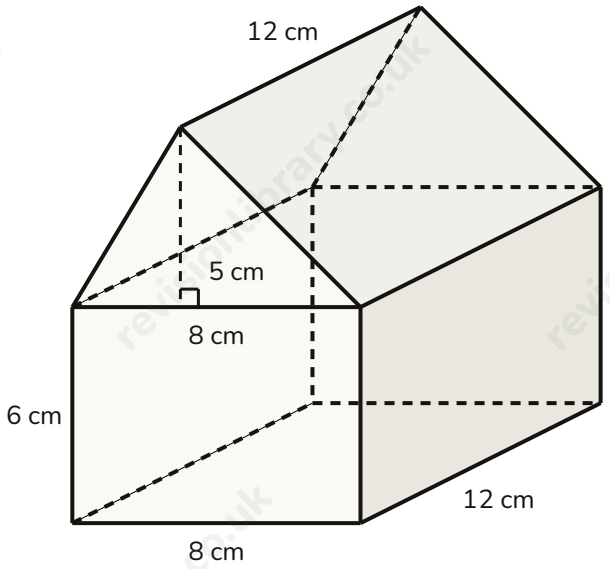


(Total for Question 24 is 3 marks)

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25 A house model is made by placing a triangular prism roof on top of a rectangular cuboid. The cuboid measures 12 cm by 8 cm by 6 cm. The roof is a triangular prism of length 12 cm where each triangular cross-section is isosceles with base 8 cm and height 5 cm. The roof sits centrally on the top of the cuboid so that a full rectangular face of the roof of area 12 cm by 8 cm is attached to the cuboid top. Calculate the total surface area of the complete model. Give your answer to 2 decimal places.

Diagram NOT accurately drawn

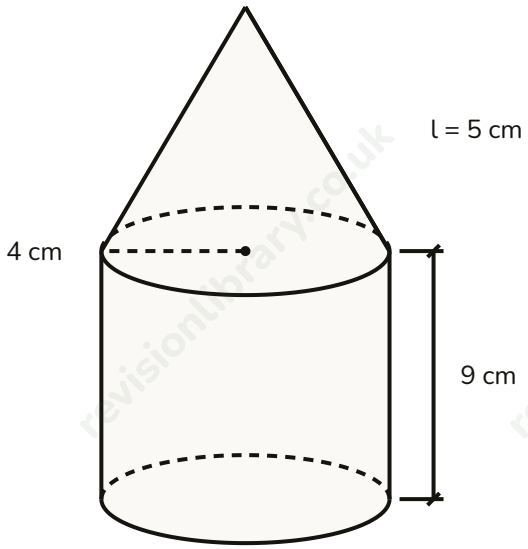


(Total for Question 25 is 4 marks)

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26 A solid is made by attaching a right circular cone to one circular face of a closed cylinder so that their bases coincide. The cylinder has radius 4 cm and height 9 cm. The cone has the same radius 4 cm and sloping height (l) 5 cm. Calculate the total surface area of the solid (do not include the area of the circle where they join). Give your answer in terms of π.

Diagram NOT accurately drawn

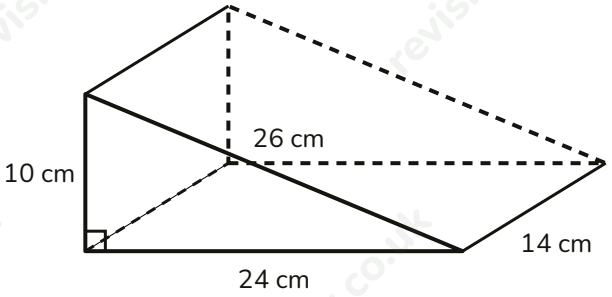


(Total for Question 26 is 4 marks)

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27 A triangular prism has triangular cross-section with sides 10 cm, 24 cm and 26 cm and length 14 cm. Calculate the total surface area of the prism.

Diagram NOT accurately drawn



(Total for Question 27 is 3 marks)

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Mark scheme · 4.12 Surface Area: 2-hour Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

areas of faces: 55, 10, 22	**M1**
doubles the sum of the three different faces	**M1**
174 cm²	**A1**

Answer: 174 cm^2

Question 2

side length = cube root of 1000 = 10	**M1**
6 x 10^2	**M1**
600 cm²	**A1**

Answer: 600 cm^2

Question 3

base 17 x 6 = 102	**M1**
four sides 2 x 4 x (17 + 6)	**M1**
286 cm²	**A1**

Answer: 286 cm^2

Question 4

areas of faces: 27, 27, 81	**M1**
doubles the sum of the three different faces	**M1**
270 m²	**A1**

Answer: 270 m^2

Question 5

30 x 47, 30 x 13, 47 x 13 found	**M1**
total surface area 4822 cm²	**M1**
4822 / 1500 = 3.21	**M1**
4 tins	**A1**

Answer: 4 tins

Question 6

side length = cube root of 1728 = 12	**M1**
6 x 12^2	**M1**
864 cm²	**A1**

Answer: 864 cm^2

Question 7

base 13 x 12 = 156	**M1**
four sides 2 x 4 x (13 + 12)	**M1**
356 cm²	**A1**

Answer: 356 cm^2

Question 8

hypotenuse $\sqrt{8^2 + 15^2}$ = 17	**M1**
two triangles 2 x 1/2 x 8 x 15 = 120	**M1**
rectangles (8 + 15 + 17) x 4	**M1**
280 cm²	**A1**

Answer: 280 cm^2

Question 9

side length = cube root of 1331 = 11	**M1**
6 x 11^2	**M1**
726 cm²	**A1**

Answer: 726 cm^2

Question 10

area of triangular face = 0.5x3x4 (= 6), doubled for two triangles (= 12)	**M1**
three rectangular faces: 3x10, 4x10, 5x10 (= 30, 40, 50)	**M1**
complete method, e.g. 12 + 30 + 40 + 50	**M1**
132 cm² cao	**A1**

Answer: 132 cm^2

Question 11

2 x π x 4^2 (= 32pi or 100.5) or 2 x π x 4 x 10 (= 80pi or 251.3) seen	**M1**
complete method, 2xpix4^2 + 2xpix4x10	**M1**
awrt 352 cm²	**A1**

Answer: 352 cm^2 (3 s.f.)

Question 12

π x 15^2 (= 225pi or 706.9) seen	**M1**
2 x π x 15 x 25 (= 750pi or 2356.2) seen, or complete method	**M1**
awrt 3060 cm²	**A1**

Answer: 3060 cm^2 (3 s.f.)

Question 13

area of L-shaped cross-section = 10x8 - 6x4 (= 80 - 24 = 56)	**M1**
perimeter of L-shaped cross-section = 10+4+6+4+4+8 (= 36)	**M1**
perimeter x length, 36 x 8 (= 288)	**M1**
complete method, 2 x 56 + 288	**dM1**
400 cm² cao	**A1**

Answer: 400 cm^2

Question 14

(a) $\sqrt{5^2 - 3^2}$ or $5^2 - 3^2$ (= 16) seen	**M1**
(a) 4 cm cso	**A1**

(a) Answer: 4 cm

(b) triangle area 0.5x6x4 (= 12), doubled (= 24)	**M1**
(b) three rectangles: 6x12, 5x12, 5x12 (= 72, 60, 60) summed	**M1**
(b) 216 cm² cao	**A1**

(b) Answer: 216 cm^2

Question 15

convert to metres 0.6, 0.2, 0.1 and apply SA = 2(lw + lh + wh)	**M1**
0.40 m² cao	**A1**

Answer: 0.40 m^2

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Question 16

calculate SA of cuboid 8x4x4: 2(8*4 + 8*4 + 4*4) = 160 cm² and cube SA 6*4^2 = 96 cm²	**M1**
subtract the two joined faces (2*16 = 32 cm²) from the sum	**M1**
160 + 96 - 32 = 224 cm² cao	**A1**

Answer: 224 cm^2

Question 17

form SA = 2(6*4 + 6h + 4h) = 188 => 48 + 20h = 188 or equivalent	**M1**
solve 20h = 140 (show working)	**M1**
h = 7 cm cao	**A1**

Answer: 7 cm

Question 18

method for surface area 6 x side^2 or show 6 x 7^2	**M1**
294 cm² cao	**A1**

Answer: 294 cm^2

Question 19

4 x π x 9^2 (= 324pi or 1017.9) seen	**M1**
awrt 1020 cm²	**A1**

Answer: 1020 cm^2 (3 s.f.)

Question 20

curved surface area 2 x π x 6^2 (= 72pi or 226.2) seen	**M1**
flat circular face π x 6^2 (= 36pi or 113.1) seen	**M1**
awrt 339 cm²	**A1**

Answer: 339 cm^2 (3 s.f.)

Question 21

(a) $\sqrt{5^2 + 12^2}$ oe	**M1**
(a) 13 cm cao	**A1**

(a) Answer: 13 cm

(b) π x 5 x 13 (= 65pi or 204.2) seen	**M1**
(b) π x 5^2 (= 25pi or 78.5) seen	**M1**
(b) awrt 283 cm²	**A1**

(b) Answer: 283 cm^2 (3 s.f.)

Question 22

form 2(lw + lh + wh) = 190 or simplify to 13w + 30 = 95 (showing steps)	**M1**
solve 13w = 65 or equivalent algebra shown	**M1**
w = 5 cm cao	**A1**

Answer: 5 cm

Question 23

method: 2(ab + ac + bc) or substitution 2(12*8 + 12*5 + 8*5)	**M1**
arithmetic for the three products summed (96 + 60 + 40 = 196) or equivalent	**M1**
392 cm² cao	**A1**

Answer: 392 cm^2

Question 24

method: total area = 2(π r^2) + 2(π r h) or substitute π*(2*r^2 + 2*r*h)	**M1**
substitute r=3, h=10 to get 2(π*9) + 2(π*3*10) = 18pi + 60pi	**M1**
78 π cm^2 cao	**A1**

Answer: 78 π cm^2

Question 25

calculate SA of cuboid: 2(12*8 + 12*6 + 8*6) = 432 cm²	**M1**
calculate SA of triangular prism: 2*area triangle where area = 1/2*8*5 = 20 => 40 and lateral = perimeter*length where perimeter = 8 + 2*$\sqrt{4^2+5^2}$ => compute lateral	**M1**
subtract the two attached faces (top of cuboid 12*8 and the corresponding rectangular face of roof) from the sum of the two SAs	**M1**
total SA = 529.67 cm² awrt 2 dp	**A1**

Answer: 529.67 cm^2

Question 26

identify surfaces: curved surface of cylinder 2 π r h$_{cyl}$ and curved surface of cone π r l, and one circular base of cylinder	**M1**
substitute r=4, h$_{cyl}$=9, l=5: cylinder curved = 2 π *4*9 = 72 π; cone curved = π*4*5 = 20 π; one base = π*4^2 = 16 π	**M1**
sum areas: 72 π + 20 π + 16 π	**M1**
108 π cm^2 cao	**A1**

Answer: 108 π cm^2

Question 27

area of triangle = 1/2 * 10 * 24 = 120 cm² (or equivalent)	**M1**
lateral area = perimeter 60 * length 14 = 840 cm²	**M1**
total surface area = 2*120 + 840 = 1080 cm² cao	**A1**

Answer: 1080 cm^2

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