

1. A can of drink is in the shape of a cylinder.  
The can has a radius of 4 cm and a height of 15 cm.

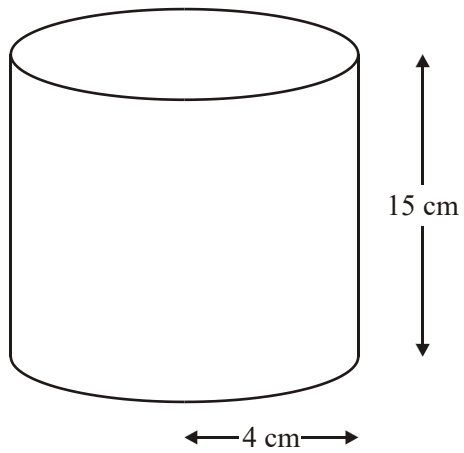


Diagram **NOT**  
accurately drawn

Calculate the volume of the cylinder.  
Give your answer correct to 3 significant figures.

.....  
(Total 3 marks)

2. The diagram shows a wedge in the shape of a triangular prism.

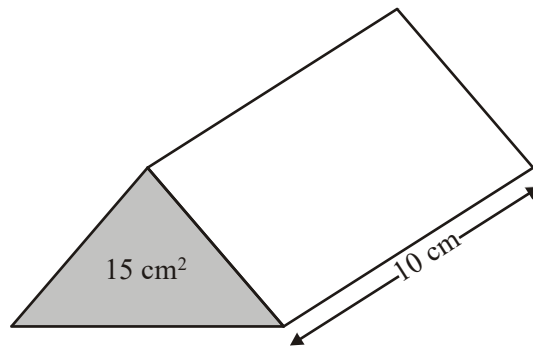


Diagram **NOT**  
accurately drawn

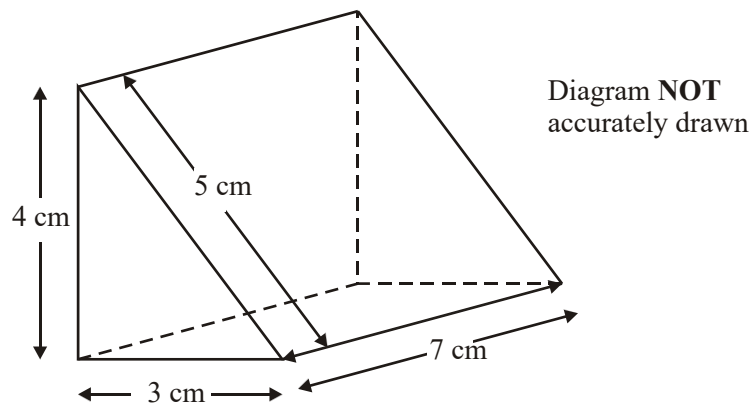
The cross section of the prism is shown as a shaded triangle.

The area of the triangle is  $15 \text{ cm}^2$ .  
The length of the prism is  $10 \text{ cm}$ .

Work out the volume of the prism.

.....  
(Total 3 marks)

3.



Calculate the volume of the triangular prism.

.....  
(Total 4 marks)

4. A cuboid has

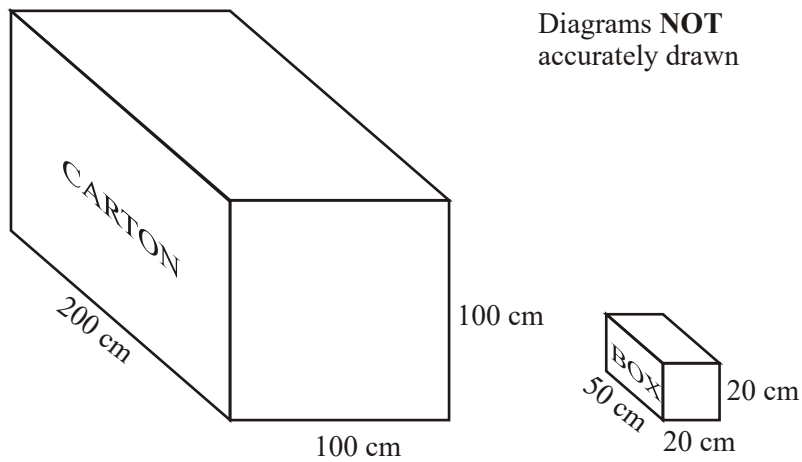
- a volume of  $40 \text{ cm}^3$
- a length of 5 cm
- a width of 2 cm

- (a) Work out the height of the cuboid.

..... cm

(2)

- (b)



A carton measures 200 cm by 100 cm by 100 cm.

The carton is to be completely filled with boxes.

Each box measures 50 cm by 20cm by 20 cm.

Work out the number of boxes which can completely fill the carton.

.....

(3)

(Total 5 marks)

5.

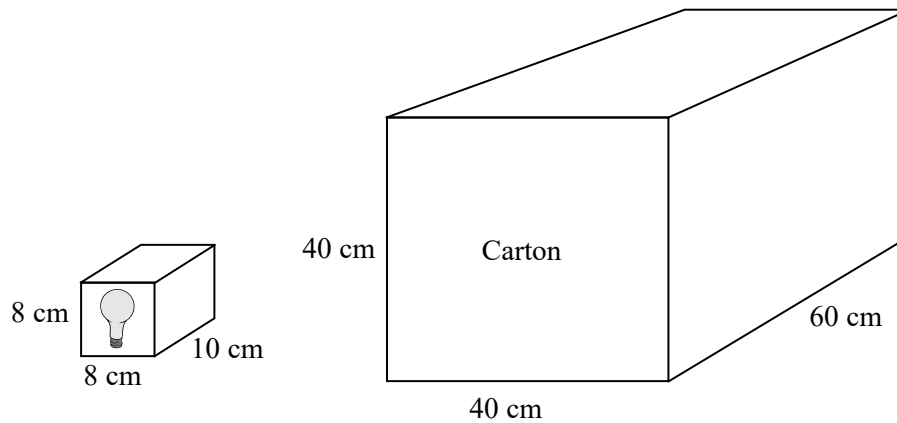


Diagram **NOT**  
accurately drawn

A light bulb box measures 8 cm by 8 cm by 10 cm.  
Light bulb boxes are packed into cartons.  
A carton measures 40 cm by 40 cm by 60 cm.

Work out the number of light bulb boxes which can completely fill **one** carton.

.....  
(Total 4 marks)

6.

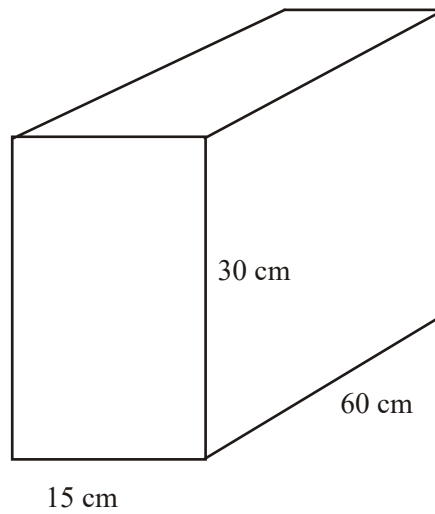


Diagram **NOT**  
accurately drawn

The diagram shows a cuboid.

The length of the cuboid is 60 cm

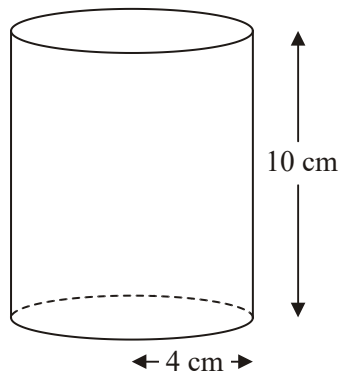
The width of the cuboid is 15 cm.

The height of the cuboid is 30 cm.

Work out the volume of the cuboid.

..... cm<sup>3</sup>  
(Total 2 marks)

7.

Diagram **NOT** accurately drawn

A solid cylinder has a radius of 4 cm and a height of 10 cm.

- (a) Work out the volume of the cylinder.  
Give your answer correct to 3 significant figures.

..... cm<sup>3</sup>

(2)

The cylinder is made from wood.

The density of the wood is 0.6 grams per  $\text{cm}^3$ .

- (b) Work out the mass of the cylinder.  
Give your answer correct to 3 significant figures.

..... grams

(2)

(Total 4 marks)

8. A cuboid has

a volume of  $120 \text{ cm}^3$ ,

a length of 6 cm,

a width of 5 cm.

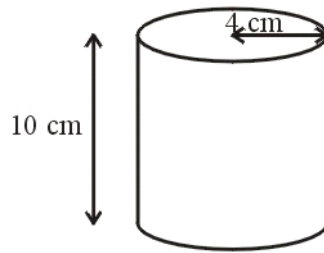
Work out the height of the cuboid.

.....cm

(Total 2 marks)



9.

Diagram **NOT** accurately drawn

The diagram shows a cylinder with a height of 10 cm and a radius of 4 cm.

- (a) Calculate the volume of the cylinder.  
Give your answer correct to 3 significant figures.

.....

(3)

The cylinder is solid.

- (b) Calculate the **total** surface area of the cylinder.  
Give your answer correct to 3 significant figures.

.....  
(3)  
(Total 6 marks)

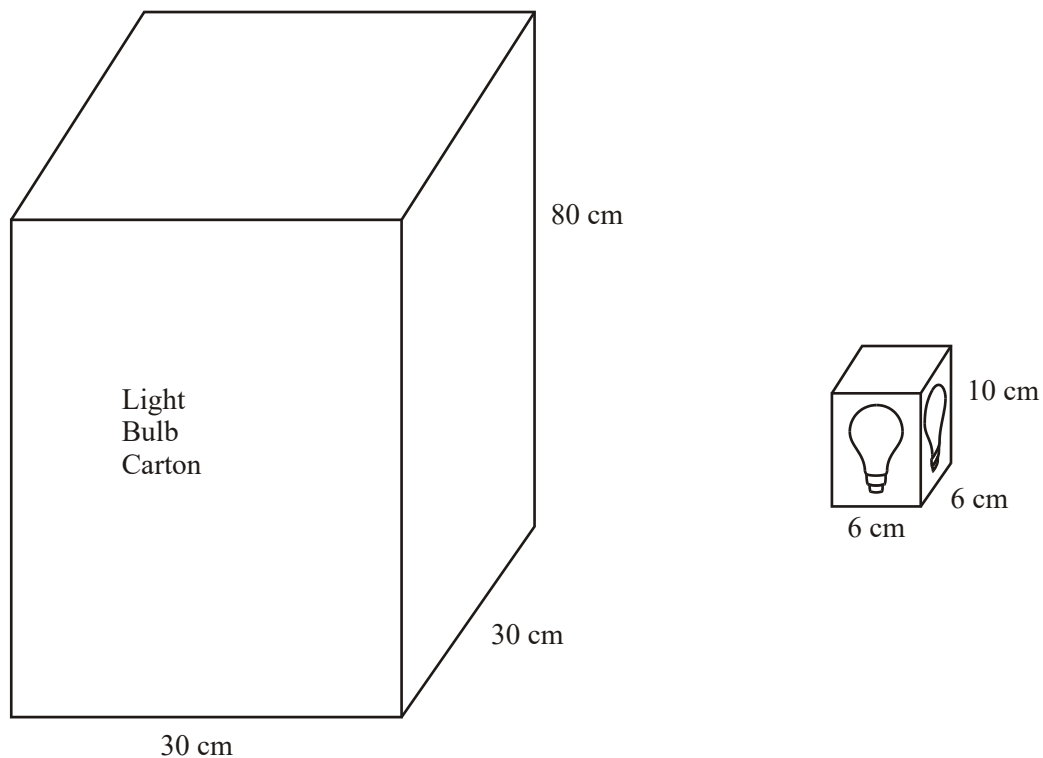
10. Ben fills a container with boxes.  
Each box is a cube of side 0.5 m.

The container is a cuboid of  
length 9 m,  
width 4 m and  
height 3 m.

Work out how many boxes will fit exactly into the container.

.....  
(Total 3 marks)

11.



Diagrams **NOT** accurately drawn

A light bulb box measures 6 cm by 6 cm by 10 cm.

Light bulb boxes are packed into cartons.

A carton measures 30 cm by 30 cm by 80 cm.

Work out the number of light bulb boxes which can completely fill **one** carton.

.....  
(Total 3 marks)

12.

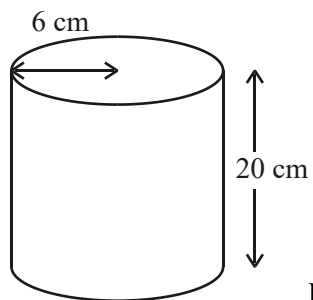


Diagram **NOT** accurately drawn

A solid cylinder has a radius of 6 cm and a height of 20 cm.

- (a) Calculate the volume of the cylinder.  
Give your answer correct to 3 significant figures.

..... cm<sup>3</sup> (2)

The cylinder is made of a material that has a density of 1.5 g/cm<sup>3</sup>.

- (b) Calculate the mass of the cylinder.  
Give your answer correct to 3 significant figures.

..... g (2)  
(Total 4 marks)

13. The diagram shows a prism.

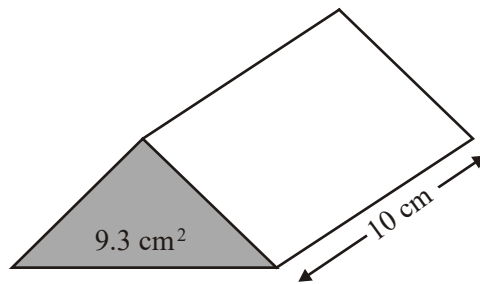


Diagram **NOT**  
accurately drawn

The cross section of the prism is a triangle of area  $9.3 \text{ cm}^2$ .  
The length of the prism is  $10 \text{ cm}$ .

Work out the volume of the prism.  
State the units of your answer.

.....  
(Total 3 marks)

14.

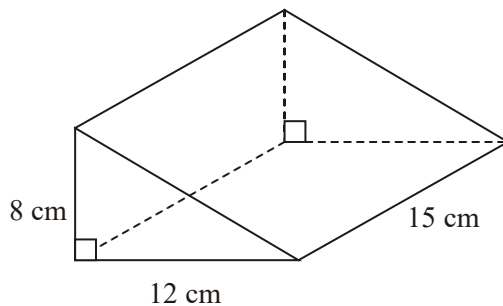


Diagram **NOT** accurately drawn

The diagram shows a solid triangular prism.

The prism is made of wood.

The wood has a density of 0.85 grams per  $\text{cm}^3$ .

Work out the mass of the prism.

..... grams  
(Total 3 marks)

15.

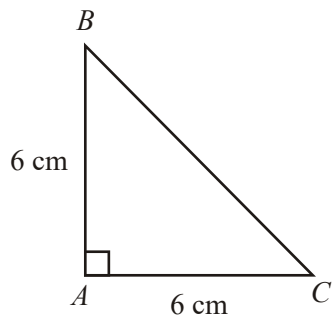


Diagram **NOT** accurately drawn

- (a) Calculate the area of triangle  $ABC$ .

.....  $\text{cm}^2$

(2)

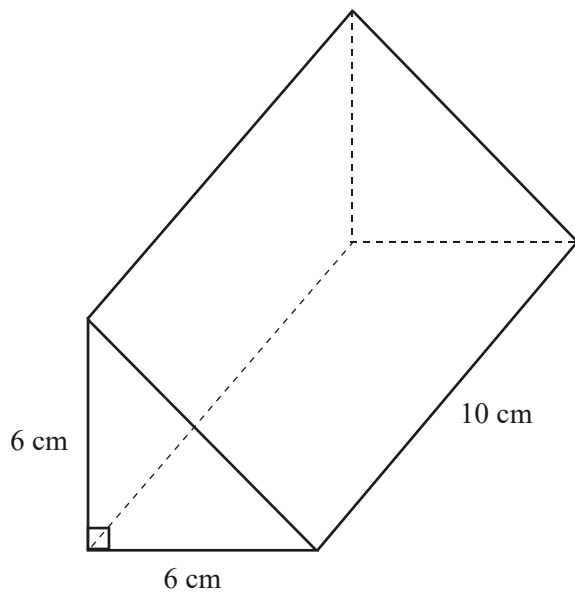


Diagram **NOT** accurately drawn

The diagram shows a solid triangular prism.

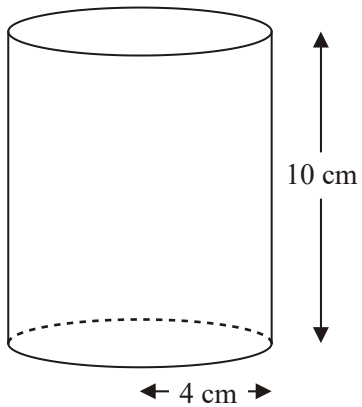
- (b) Calculate the volume of the prism.

.....  $\text{cm}^3$

(2)

**(Total 4 marks)**

16.

Diagram **NOT** accurately drawn

A solid cylinder has a radius of 4 cm and a height of 10 cm.

Work out the volume of the cylinder.

Give your answer correct to 3 significant figures.

..... cm<sup>3</sup>  
(Total 2 marks)



17.

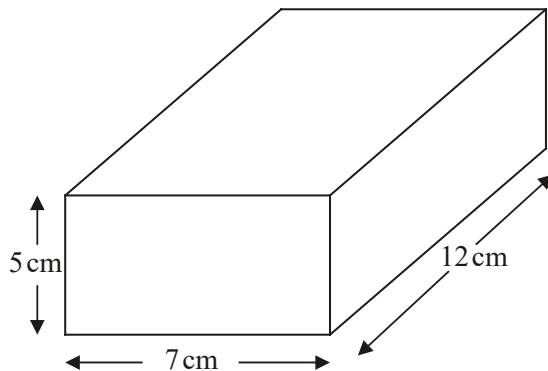


Diagram **NOT** accurately drawn

Work out the volume of the cuboid.

..... cm<sup>3</sup>  
(Total 2 marks)

18.

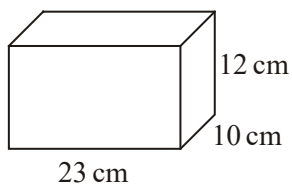


Diagram **NOT** accurately drawn

(a) Work out the volume of this solid cuboid.

..... cm<sup>3</sup>  
(2)

The solid cuboid is made of plastic.  
 The plastic has a density of 0.8 grams per  $\text{cm}^3$ .

(b) Work out the mass of the cuboid.

..... grams

(2)

(Total 4 marks)

19. The diagram shows a prism.

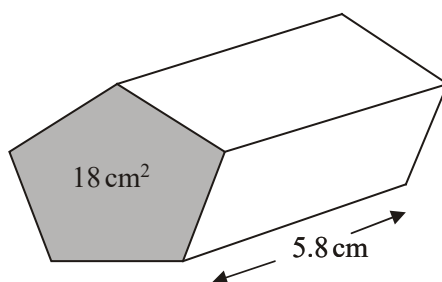


Diagram **NOT** accurately drawn

The area of the cross section of the prism is  $18 \text{ cm}^2$ .  
 The length of the prism is 5.8 cm.

Work out the volume of the prism.

.....  $\text{cm}^3$

(Total 2 marks)

1.  $754 \text{ cm}^3$  3  
 $\pi n \times 4^2 \times 15 = 753.6$   
*M1 for  $\pi \times 4^2 \times 15$*   
*A1 for 753.6 to 754.1*  
*B1 (indep) for  $\text{cm}^3$*  [3]
2.  $150 \text{ cm}^3$  3  
 $15 \times 10$   
*M1 for  $15 \times 10$*   
*A1 for 150*  
*B1 for  $\text{cm}^3$*  [3]
3.  $42 \text{ cm}^3$  4  
 $\frac{1}{2} \times 4 \times 3 \times 7$   
*M1 for  $\frac{1}{2} \times 4 \times 3$  or attempt at area of triangle (accept  $4 \times 3$ )*  
*M1 for "their area"  $\times 7$  or where 7 is part of a triple product*  
*A1 for 42 cao*  
*B1 for  $\text{cm}^3$*  [4]
4. (a)  $2 \times 5 = 10$   
 $40 \div 10 = 4$   
 OR  $(40 \div 5) \div 2 = 4$  2  
*M1  $2 \times 5$  or  $40 \div 5$  or  $40 \div 2$ , or 10, 8, 20 seen*  
*A1 cao*
- (b)  $(200 \div 50) \times (100 \div 20) \times (100 \div 20)$   
 $= 4 \times 5 \times 5 =$   
 100 3  
*M1 Attempt one division (eg  $200 \div 50$ ), or find one volume*  
 *$200 \times 100 \times 100$  or  $50 \times 20 \times 20$*   
*M1  $(200 \div 50) \times (100 \div 20) \times (100 \div 20)$ , or "200000"  $\div$*   
*"20000"*  
*A1 cao* [5]

5.  $5 \times 5 \times 6 = 150$

4

*M1 for attempt at 1 division (e.g.  $40 \div 8$ ), may be implied by marks or number on one edge of diagram or by 5 or 6 seen*

*M1 for attempt at 3 divisions ( $40 \div 8$ ,  $40 \div 8$ ,  $60 \div 10$ ), may be implied by marks or numbers on diagram or by 5, 5 and 6 seen.*

*M1 (dep on 1<sup>st</sup> M1) for “5” × “5” × “6”*

*A1 cao*

*Alternatively*

*M1 for  $40 \times 40 \times 60$  or  $8 \times 8 \times 10$  or 96000 or 640 seen*

*M1 for  $40 \times 40 \times 60$  and  $8 \times 8 \times 10$  or 96000 and 640 seen*

*M1 (dep on 1<sup>st</sup> M1) for “(40 × 40 × 60)” ÷ “(8 × 8 × 10)”*

*A1 cao*

*SC:BI for dividing area of one carton face by area of corresponding box face if M0*

[4]

6.  $60 \times 15 \times 30 = 27000$

2

$= 27000$

*M1  $60 \times 15 \times 30$*

*A1 cao*

[2]

7. (a)  $\pi \times 4^2 \times 10 = 502.65$

(502 – 503)

503

2

*M1  $\pi \times 4^2 \times 10$  (= 502.65)*

*A1 502-503*

*SC BI  $\pi \times 8^2 \times 10$*

(b) “502.65” × 0.6 = 301.59

302

2

*M1 “502.65” × 0.6*

*A1 300 – 302 ft on “502.65” to an answer which would be correct on ft if rounded or truncated to 3SF*

[4]

8. 4 cm 2
- $120 = 6 \times 5 \times \text{height}$
- $\text{height} = \frac{120}{(6 \times 5)}$
- M1 for  $\frac{120}{(6 \times 5)}$*
- Al cao*
- [2]**
- 
9. (a) 502 – 503 cm<sup>3</sup> 3
- $V = \pi \times 4^2 \times 10$
- M1 for  $\pi \times 4^2 \times 10$*
- Al 502 to 503*
- B1 (indep) for cm<sup>3</sup>*
- (b) 351 to 352 cm<sup>2</sup> 3
- $SA = \pi \times 8 \times 10 + 2 \times \pi \times 4^2$
- M1 for  $\pi \times 8 \times 10$*
- M1 (indep) for  $\pi \times 4^2$*
- Al for 351 to 352*
- [6]**
- 
10. 864 3
- $9 \div 0.5 (= 18)$
- $4 \div 0.5 (= 8)$
- $3 \div 0.5 (= 6)$
- M1 for  $9 \div 0.5$  or  $4 \div 0.5$  or  $3 \div 0.5$*
- M1 for “18” × “8” × “6”*
- Alt. Method: M1 for  $9 \times 4 \times 3$  or  $0.5 \times 0.5 \times 0.5$*
- M1 for “108” ÷ “0.125”*
- Al for 864*
- [3]**

11. 200 3  
 $5 \times 5 \times 8$   
*MI for  $80 \div 10$  or  $30 \div 6$  (or 8 or 5 seen)*  
*or  $(80 \times 30) \div (10 \times 60)$*   
*or  $(30 \times 30) \div (6 \times 6)$  o.e*  
*MI for "5"  $\times$  "5"  $\times$  "8"*  
*[Alternative : MI for  $30 \times 30 \times 80$  or  $6 \times 6 \times 10$*   
*MI for attempting to divide "72000" by "360"]*  
*AI cao*  
**[3]**
12. 2260 cm<sup>3</sup> 4  
 $\pi \times 6^2 \times 20$   
*MI for  $\pi \times 6^2 \times 20$  (= 2261.9...)*  
*AI for  $2260 \leq \text{ans} \leq 2262$*   
 3390 g  
 "a"  $\times$  1.5  
*MI for "a"  $\times$  1.5*  
*AI ft from (a)*  
**[4]**
13.  $9.3 \times 10$   
 93  
 cm<sup>3</sup> 3  
*MI for  $9.3 \times 10$*   
*AI for 93*  
*B1 (indep.) for cm<sup>3</sup>*  
**[3]**
14.  $\frac{1}{2} \times 12 \times 8 \times 15 \times 0.85$   
 612 3  
*MI for  $\frac{1}{2} \times 12 \times 8 \times 15$  or 720 seen*  
*MI (indep) for their volume  $\times 0.85$*   
*AI cao*  
*SC: If no marks scored, an answer of 1224 scores M0 M1 A0*  
**[3]**

15. (a)  $\frac{1}{2} \times 6 \times 6$   
 18  
*MI for  $\frac{1}{2} \times 6 \times 6$  oe*  
*AI cao* 2
- (b)  $18 \times 10$   
 180  
*MI for "a"  $\times 10$  or  $\frac{1}{2} \times 6 \times 6 \times 10$*   
*AI ft* 2
- [4]**
16.  $\pi \times 4^2 \times 10 = 502.65$   
 (502 – 503)  
 503  
*MI for  $\pi \times 4^2 \times 10$  (= 502.65)*  
*AI for 502 – 503*  
*SC: BI for  $\pi \times 8^2 \times 10$*  2
- [2]**
17.  $5 \times 7 \times 12$   
 420  
*MI for  $5 \times 7 \times 12$*   
*AI for 420 cao* 2
- [2]**
18. (a)  $23 \times 10 \times 12$   
 2760  
*MI for  $23 \times 10 \times 12$*   
*AI cao* 2
- (b)  $2760 \times 0.8$   
 2208  
*MI for '2760'  $\times 0.8$*   
*AI f.t.* 2
- [4]**

19.  $18 \times 5.8 = 104.4$

2

*M1 for  $18 \times 5.8$* *A1 for 104.4 cao***[2]****1. Paper 4**

The many candidates who were not able to remember the formula or process for calculating the volume of a cylinder were at a significant disadvantage. Most methods used involved some calculation involving  $\pi$ . The majority of candidates did not include any units with their answer, let alone the correct units.

**Paper 6**

This was very well done, although some candidates left off the units of volume. There were a few  $2\pi r^2$  and one or two used  $2\pi r$ .

**2. Mathematics A****Paper 3**

This was a successful question for later on in the paper and many candidates worked out the volume to be 150. Some, though, believed that  $15 \text{ cm}^2$  implied multiplying 15 by 15 and some divided 150 by 2, most likely because of the triangular cross-section. It was pleasing that more than half of the candidates included the correct units,  $\text{cm}^3$ , with their volume even though there was no prompt in the question.

**Paper 5**

Many candidates calculated the correct volume of the prism and gave the correct units. Weaker candidates frequently squared 15 before multiplying by 10 and left out the units.

**Mathematics B Paper 16**

Nearly 70% gained at least one mark in this question, and usually 2. Many candidates either failed to give units to their solutions or gave incorrect units.  $(15 \times 10)/2$  and  $15^2 \times 10$  were the most common errors. Final answers of  $150^3$  and  $150^2$  were seen on many occasions and were treated as a genuine attempt to give an answer with units and were awarded 2 out of the 3 marks.



### 3. Paper 3

Many candidates had the correct idea of multiplying the area of the cross-section by the length but made errors in finding the area of the triangle. Areas of 12 were very common – usually from  $4 \times 3$  but sometimes from  $3 + 4 + 5$ .

Some candidates simply multiplied all the given lengths and others confused volume with surface area even though the formula for the volume of a prism is given on the formula sheet.

Disappointingly, the units were often omitted or given as  $\text{cm}^2$ .

### Paper 5

This question was very well answered with about 70% of candidates obtaining full marks. An extra 14% of candidates obtained 3 marks a common mistake being to omit the units. A few candidates used the distracter of 5cm to try to calculate the volume by multiplying 3, 4, 5 and 7 together. They received no credit for this.

4. Part (a) was also well attempted, with many correct answers seen. Some candidates had an idea of what was needed, and attempted a trial and improvement approach to finding the missing side, usually involving a partial method involving  $5 \times 2$ . In part (b) methods were split between those who did volume calculations, and those who considered the corresponding sides. In the first case candidates worked out the volumes, but were then unable to perform the volume division successfully. In the later case many candidates obtained the 4, 5, 5 but then added them. Of both methods the later most commonly led to the correct answer.

### 5. Foundation Tier

Many candidates gained part marks on this question. Some candidates calculated that there were 5 in a row, 5 high and 6 back but then decided to add together these three numbers rather than to multiply them. Many candidates made good use of the diagram to mark off the section, which gained them credit if they had done so correctly. Other candidates attempted a more 'long winded' approach in multiplying the dimensions of the large carton together and the small boxes together and then attempting to divide. Whilst this approach would have given the correct solution the candidates often failed in obtaining the correct results to their multiplications.

### Intermediate Tier

Most candidates attempted this question with few failing to gain at least one of the four marks. Those who attempted to find out how many boxes fitted into each side of the carton, i.e. 5, 5 and 6, tended to be more successful. Sometimes, though, 5, 5 and 6 were added, leading to a common incorrect answer of 16. Some simply worked out 56, giving the number of boxes that fitted into one face of the carton. Those who calculated the volume of the carton and the volume of the box and divided the former by the latter frequently made arithmetical errors. These were commonly made when working out the volume of the carton ( $40 \times 40 \times 60$ ) and in the final division.

**6. Foundation Tier**

It is very disappointing to report that fewer candidates than usual were able to find the volume of a cuboid. Over 90% of candidates had added the dimensions. They usually gave “105” as their answer with or without working.

**Intermediate Tier**

It was rare to see working in this question, but the success rate was high. The most common error was addition rather than multiplication.

7. For a standard volume question this was poorly answered. Common errors included circumference  $\times$  height,  $k\pi r^2$  where  $k$  was usually 2 (from 2 ends?), 0.5 or 4. Some candidates evaluated  $\pi \times 4^2$  as  $(\pi \times 4)^2$ .
- Part (b) was generally well done with the vast majority of candidates multiplying their answer to part (a) by 0.6.
8. Many candidates gained full marks in this question. However a significant number made glaring mistakes. Many chose to multiply all three figures and answers of 30 and 11 ( $6 + 5$ ) were often seen, some candidates gave 90 as their answer ( $120 - 30$ ). Trial and improvement methods were employed with varying degrees of success.
9. In this question candidates were being tested on their knowledge of the use of appropriate units. The mark was available in either part (a) or part (b) provided there was no contradiction by one incorrect unit. This was often missed by candidates, failing to offer any units at all. This question caused great confusion for all but the more able candidates, in applying the correct formulae. Pi was often omitted completely from working. The formula for the area of a circle was usually known and this accounted for the only mark gained by many candidates. Part (a) was done better than part (b), the curved surface area being attempted only in part (b).
10. Few candidates had any idea about the relationship between the dimensions of the container and the dimensions of the box. The majority scored 1 mark, usually by finding the volume of the container,  $108 \text{ m}^3$ , or by dividing one of the dimensions by 0.5. Those using the former method then usually divided the volume by 0.5 to give 216, which was the most common wrong answer. The latter method often resulted in an answer of 32 ( $18 + 8 + 6$ ) but more usually led to the award of full marks.

**11. Foundation Tier**

This question was attempted by most candidates with the vast majority of the 52% who scored at least one mark achieving the multiplier of one of the sides being 5 or 8, either by calculation or by divisions on the diagram, scoring the first method mark. The connection between the lengths of the sides of the cuboids was frequently investigated with statements such as '80 divided by 10' or ' $10 \times 8 = 80$ ' indicating this. However only 7% of the candidates scored all 3 available marks.

The other approach of calculating the volumes was also seen with ' $6 \times 6 \times 10$ ' and ' $30 \times 30 \times 80$ '. Beyond this there was less certainty of how to proceed. The triple multiplication of ' $5 \times 5 \times 8$ ' was not always correctly evaluated whilst the alternative of dividing the two volumes rarely lead to the correct outcome. A popular misconception was to add together the lengths such that ' $10 + 6 + 6 = 22$ ' and combine it with ' $30 + 30 + 80 = 140$ ' in attempting to reach the answer.

**Intermediate Tier**

There were many correct answers, both methods being equally popular although finding the volumes of the light bulb box and the carton did lead to a number of arithmetic errors;  $6 \times 6 \times 10 = 120$ ,  $30 \times 30 \times 80 = 720$  or 7200 and  $30 \times 30 \times 80 = 9100$  being the main causes. Many obtaining 72000 could then not divide accurately by 360.

The alternative method, while more successful, did lead to some candidates considering just one layer/column of boxes, giving  $8 \times 5 = 40$ , for example, as their answer.

Amongst the conceptual errors were candidates using perimeters and finding the sum of 5, 5 and 8, instead of the product.

- 12.** Just over 30% of candidates failed to gain marks in part (a). This generally arose from the use of an incorrect formula to find the volume of a cylinder. Some candidates attempted to use the formula for the surface area rather than the volume of a cylinder. Of those candidates who used the correct formula the vast majority were successful in going on to obtain the correct answer. In part (b) again, about 30% of candidates failed to score any marks. The most common reason for this was resulted from candidates dividing instead of multiplying by the density.
- 13.** The vast majority of candidates were able to score full marks on this question. Some candidates failed to obtain the independent mark available for providing the correct units with their answer. The common error here was to give the units as  $\text{cm}^2$  rather than  $\text{cm}^3$ .

14. Finding the mass of the prism needed a strategy to obtain the correct result. Only 29% reached the correct answer of 612 grams. Calculating the area of the right-angled triangle followed by multiplying by the length was the first stage to obtain the volume of the prism.

Multiplying this volume by the density the second stage to achieve the final answer. There were various attempts at calculating the volume of the prism but a significant number used the dimensions to find the volume of a cuboid using  $8 \times 12 \times 15 = 1440$  and forgetting to halve this result. There were also many candidates who calculated the surface area of the shape.

The second method mark was for the realisation that 'their' volume needed to be multiplied by 0.85 to produce the mass. For others it was somewhat of a gamble as to whether they should multiply or divide by 0.85. There were some very well written and organised solutions to this question in which each detail of the process was clearly shown. Around 40% scored 1 mark for either  $\frac{1}{2}(8 \times 12 \times 5)$  or, more commonly, multiplying their volume by 0.85. A few candidates tried to cube 0.85 and multiply this by their volume. Several found the surface area of the shape rather than the volume and others just added together the dimensions of the prism.

15. Although the majority of candidates accurately calculated the area of the given triangle in part (a), very many disappointingly gave an answer of 36 ( $6 \times 6$ ). Full marks were still however available in part (b) for accurately calculating 10 x their answer in (a).
16. Success in this question was dependent on candidates being able to recall the correct formula for the volume of a cylinder. Many incorrect formulae were seen.; these generally involved the circumference rather than the area of a circle, the use of the formula for the volume of a cone or the area of a rectangle. A minority of candidates wrote down the correct calculation but then used their calculator incorrectly. A number of candidates neglected to calculate the volume, having found the area of the circle correctly. There were a few who correctly found the surface area of the cylinder; a more complicated process than calculating the volume.
17. A well understood topic that was well understood though a minority of candidates did try to find the surface area rather than the volume of the cuboid.
18. This question was answered well. Over 85% of candidates gained 1 or more marks for their answers. Most candidates could find the volume of the cuboid though some attempts at finding the total surface area were seen. In part (b) nearly all candidates either multiplied or divided their answer to part (a) by 0.8. Those who multiplied were able to access both marks for this part. Full marks for the question were awarded to over a half of the candidates entered for this examination.

19. Candidates should have found this to be a simple application of the formula for working out the volume of a prism, given on page 2 of the question paper. Two thirds of candidates were awarded both marks.

Unfortunately some candidates who wrote down “ $18 \text{ cm}^2 \times 5.8 \text{ cm}$ ” in the working space then proceeded to work out “ $18^2 \times 5.8$ ” revealing an apparent lack of understanding of the notation used for the area of cross section. Some candidates appeared to be trying to work out surface areas.