

1 A box is to be filled with cartons.

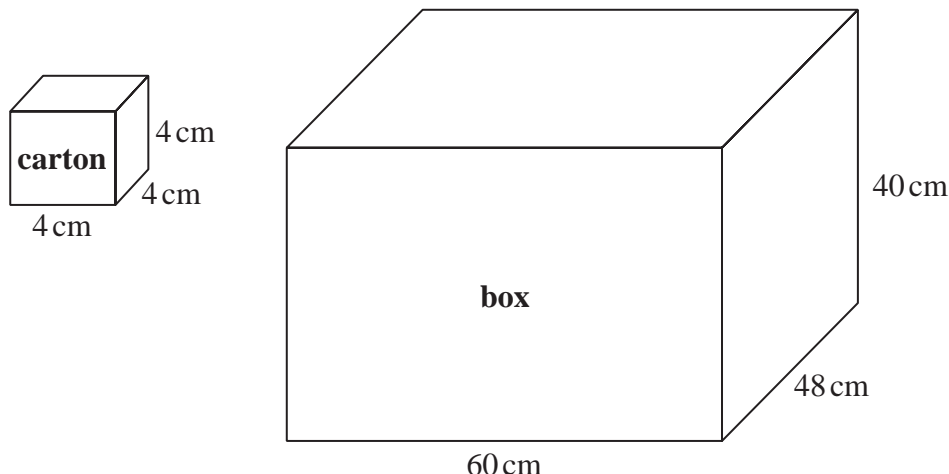


Diagram **NOT** accurately drawn

Each carton is a cube that measures 4 cm by 4 cm by 4 cm.
The box is a cuboid that measures 60 cm by 48 cm by 40 cm.

VOLUME
width \times length \times height

Work out the number of cartons that can completely fill the box.

Work out how many cartons fit into the box's volume

$$\text{Volume of carton} = 4 \times 4 \times 4 = 64 \text{ cm}^3 \quad (1)$$

$$\text{Volume of box} = 60 \times 48 \times 40 = 115\,200 \text{ cm}^3$$

$$(1) \quad 115\,200 \div 64 = 1800 \text{ cartons}$$

— OR —

Work out how many cartons fit along each edge.

$$60 \div 4 = 15 \text{ cartons along width}$$

$$48 \div 4 = 12 \text{ cartons along depth}$$

$$40 \div 4 = 10 \text{ cartons along height}$$

$$(1) \quad 15 \times 12 \times 10 = 1800$$

1800 (1)

(Total for Question 1 is 3 marks)

Alternative 2 marks
for method.

2 The diagram shows a solid cylinder with radius 3 m.

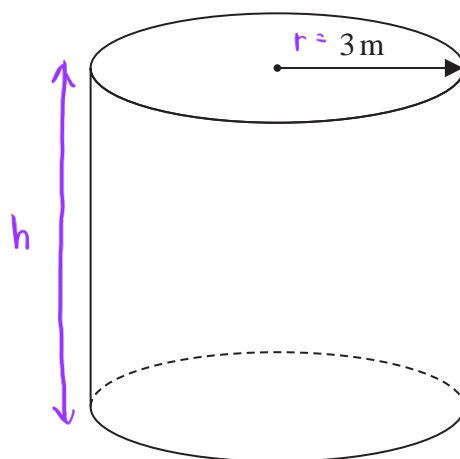


Diagram **NOT** accurately drawn

The volume of the cylinder is $72\pi\text{ m}^3$

$$\text{Volume of cylinder} = \pi r^2 h$$

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

$$\text{Volume} = 72\pi = \pi \times 3^2 \times h \quad (1)$$

$$h = \frac{72\pi}{9\pi} = 8\text{ m} \quad (1)$$

$$\begin{aligned} \text{Area of base} &= \pi r^2 = \pi \times 3^2 \\ &= 9\pi \end{aligned}$$

$$\begin{aligned} 2 \text{ bases} &= 2 \times 9\pi \\ &= 18\pi \end{aligned}$$

$$\begin{aligned} \text{Area of lateral face} &= 2 \times \pi \times r \times h \\ &= 2 \times \pi \times 3 \times 8 \\ &= 48\pi \quad (1) \end{aligned}$$

$$\begin{aligned} \text{Total surface area} &= 18\pi + 48\pi \\ &= 66\pi = 207\text{ m}^2 \quad (1) \end{aligned}$$

207

.....m²

(Total for Question 2 is 5 marks)

3 Here is a triangular prism.

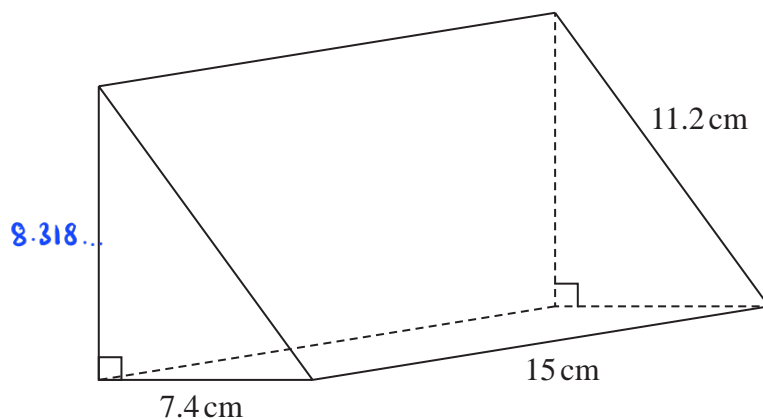


Diagram **NOT**
accurately drawn

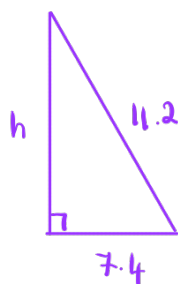
Work out the volume of the prism.

Give your answer correct to 3 significant figures.

cross section of the prism :

$$h = \sqrt{11.2^2 - 7.4^2} \quad (1)$$

$$= 8.407 \dots \quad (1)$$



Area of cross section :

$$\frac{1}{2} \times 7.4 \times 8.407 \dots$$

$$= 31.106 \dots \quad (1)$$

Volume of prism = Area of cross section \times length

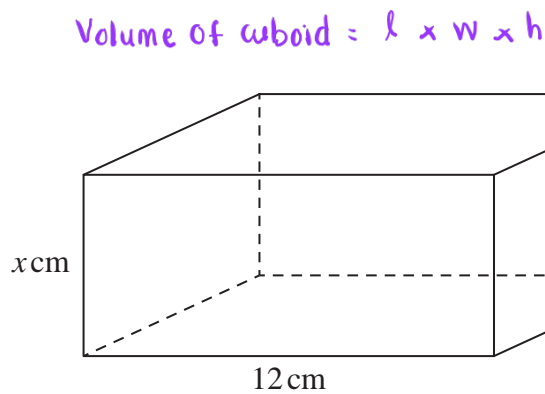
$$= 31.106 \dots \times 15 \quad (1)$$

$$= 467 \quad (1)$$

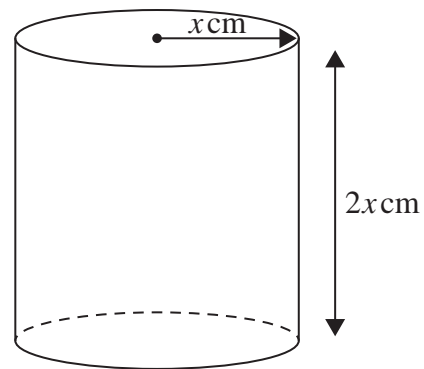
467 cm³

(Total for Question 3 is 5 marks)

- 4 The diagram shows a cuboid and a cylinder.



Volume of cylinder: $\pi \times r^2 \times h$ Diagram **NOT** accurately drawn



The dimensions of the cuboid are x cm by 12 cm by 5 cm.
The volume of the cuboid is 270 cm^3

The radius of the cylinder is x cm.
The height of the cylinder is $2x$ cm.

- (a) Work out the volume of the cylinder.
Give your answer correct to the nearest whole number.

$$\begin{aligned}\text{Volume of cuboid} &= 12 \times 5 \times x = 270 \\ &= 60x = 270 \\ x &= \frac{270}{60} \\ &= 4.5 \text{ cm (1)}\end{aligned}$$

$$\begin{aligned}\text{Volume of cylinder} &= \pi \times x^2 \times 2x \\ &= \pi \times (4.5)^2 \times 2(4.5) \text{ (1)} \\ &= 573 \text{ cm}^3 \text{ (1)}\end{aligned}$$

$$\begin{array}{r} 573 \\ \hline \end{array} \text{ cm}^3 \quad (3)$$

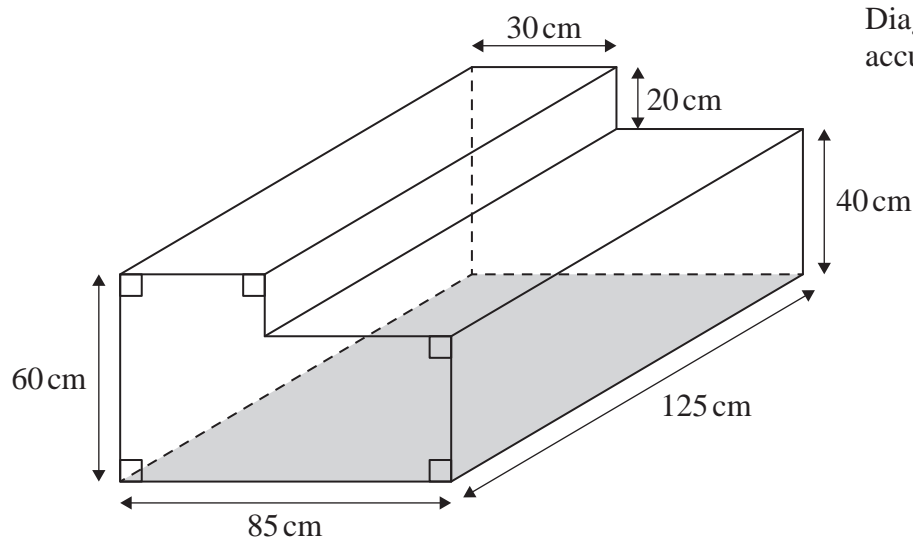
- (b) Change 1 m^3 to cm^3

$$\begin{array}{c} \begin{array}{c} \times 100 \\ \text{m} \rightarrow \text{cm} \\ \div 100 \end{array} \quad \begin{array}{c} \times (100)^3 \\ \text{m}^3 \rightarrow \text{cm}^3 \\ \div (100)^3 \end{array} \\ 1 \text{ m}^3 \times \frac{(100)^3 \text{ cm}^3}{(1)^3 \text{ m}^3} = 1\,000\,000 \text{ (1)} \end{array}$$

$$\begin{array}{r} 1\,000\,000 \\ \hline \end{array} \text{ cm}^3 \quad (1)$$

(Total for Question 4 is 4 marks)

5 The diagram shows a container for water in the shape of a prism.



The rectangular base of the prism, shown shaded in the diagram, is horizontal.
The container is completely full of water.

Tuah is going to use a pump to empty the water from the container so that the volume of water in the container decreases at a constant rate.

The pump starts to empty water from the container at 1030 and at 1200 the water level in the container has dropped by 20 cm.

Find the time at which all the water has been pumped out of the container.

$$85 \times 125 \times 40 = 425\,000 \text{ cm}^3 \quad (\text{water left in container})$$

$$\textcircled{1} \quad 30 \times 20 \times 125 = 75\,000 \text{ cm}^3 \quad (\text{water that has been pumped out})$$

$$\frac{75\,000 \text{ cm}^3}{425\,000 \text{ cm}^3} = \frac{1.5 \text{ hour}}{x}$$

$$x = \frac{425\,000 \times 1.5}{75\,000} \quad \textcircled{2}$$

$$= 8.5 \text{ hours}$$

$$1200 + 8.5 \text{ hours} = 2030 \quad \textcircled{1}$$

2030

(Total for Question 5 is 4 marks)

6 The diagram shows a cuboid.

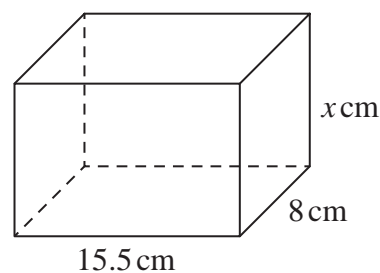


Diagram **NOT**
accurately drawn

The volume of the cuboid is 806 cm^3

(b) Work out the value of x .

$$\text{volume of cuboid} = 15.5 \times 8 \times x$$

$$= 124x$$

$$806 = 124x \quad (1)$$

$$x = 806 \div 124 \quad (1)$$

$$x = 6.5 \quad (1)$$

$$x = \frac{6.5}{(3)}$$

(Total for Question 6 is 3 marks)

7 The diagram shows a solid wooden cuboid.

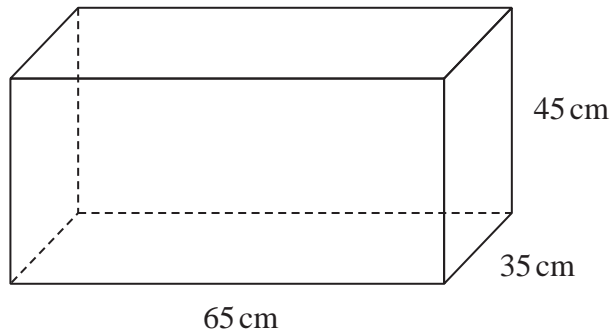


Diagram **NOT**
accurately drawn

The cuboid measures 65 cm by 35 cm by 45 cm.

A machine cuts the cuboid to make cubes.
Each cube has edges of length 5 cm.

Work out the maximum number of cubes that can be made from the cuboid.

$$\begin{aligned}\text{Volume of cuboid} &: 65 \times 35 \times 45 \\ &= 102\,375 \text{ (1)}\end{aligned}$$

$$\begin{aligned}\text{Volume of cube} &: 5 \times 5 \times 5 \\ &= 125\end{aligned}$$

$$\begin{aligned}102\,375 \div 125 &\text{ (1)} \\ &= 819 \text{ (1)}\end{aligned}$$

819

(Total for Question 7 is 3 marks)

8 The diagram shows a box **B** and a carton **C**

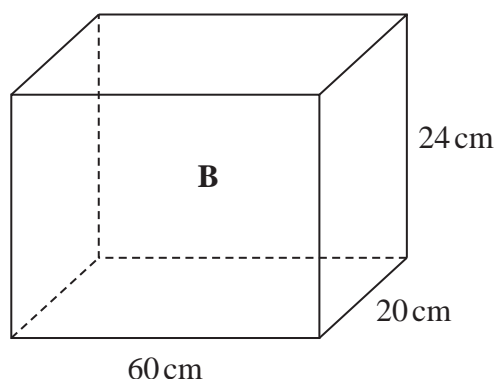
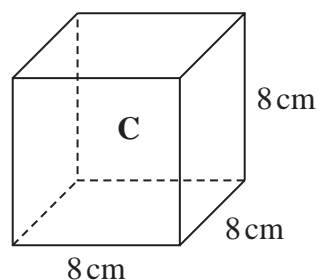


Diagram **NOT**
accurately drawn



The box **B** is in the shape of a cuboid.

Each carton **C** is in the shape of an 8 cm cube.

Martha is going to put as many of the cartons as possible into the box.

She has enough cartons to do this.

Martha will then fill the remaining space inside the box with packing material.

Work out the volume of the space inside the box that Martha will fill with packing material.

$$\text{height : } \frac{24}{8} = 3$$

$$\text{length : } \frac{60}{8} = 7.5 \quad \textcircled{1}$$

$$\approx 7$$

$$\text{width : } \frac{20}{8} = 2.5$$

$$\approx 2$$

$$3 \times 2 \times 7 = 42 \quad \textcircled{1}$$

$$\text{Volume} = 60 \times 20 \times 24$$

$$= 28\,800 \text{ cm}^3 \quad \textcircled{1}$$

$$\text{Volume} = 8 \times 8 \times 8$$

$$= 512 \text{ cm}^3$$

$$28\,800 - 42(512) \quad \textcircled{1}$$

$$= 28\,800 - 21\,504$$

$$\approx 7\,296 \quad \textcircled{1}$$

$$7\,296 \text{ cm}^3$$

(Total for Question 8 is 5 marks)

9

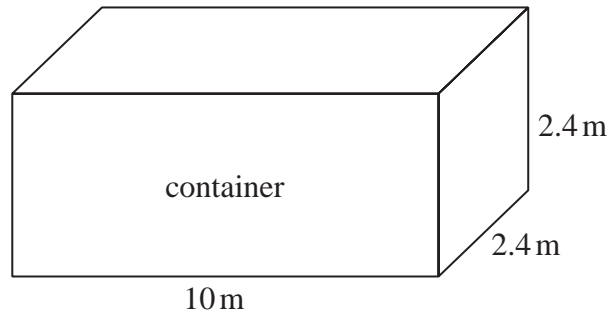
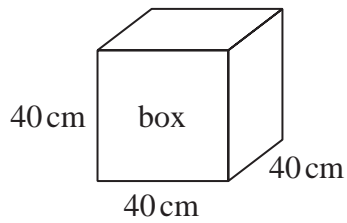


Diagram **NOT**
accurately drawn

Tom puts boxes into a shipping container.

The container is a cuboid 10 metres by 2.4 metres by 2.4 metres.
Each box is a cube of side 40 centimetres.

Work out the greatest number of these boxes that Tom can put into the container.

$$\text{length : } \frac{10}{0.4} = 25 \quad (1)$$

$$\text{width : } \frac{2.4}{0.4} = 6$$

$$\text{height : } \frac{2.4}{0.4} = 6$$

$$25 \times 6 \times 6 = 900 \quad (1) \quad (1)$$

900

(Total for Question 9 is 3 marks)

10 The diagram shows a solid triangular prism.

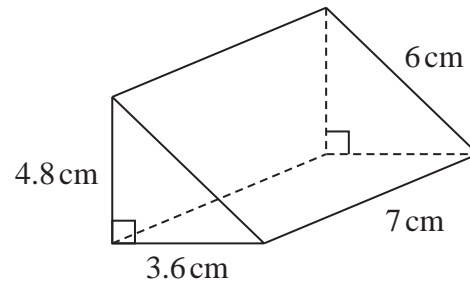


Diagram **NOT**
accurately drawn

Work out the **total** surface area of the triangular prism.
Give your answer correct to 3 significant figures.

$$\left(2 \times \frac{1}{2} \times 4.8 \times 3.6\right) + (7 \times 6) + (7 \times 3.6) + (4.8 \times 7)$$

$$= 17.28 + 42 + 25.2 + 33.6$$

$$= 118.08$$

$$\approx 118$$

118

..... cm²

(Total for Question 10 is 3 marks)

11 The diagram shows two solids, **A** and **B**, made from two different metals.

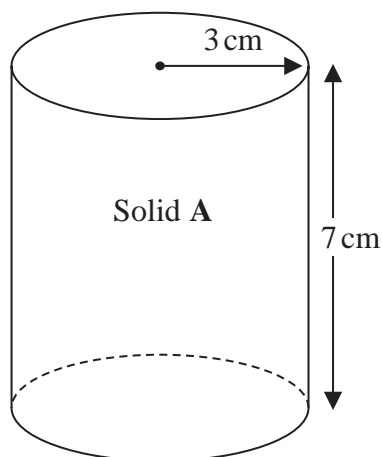
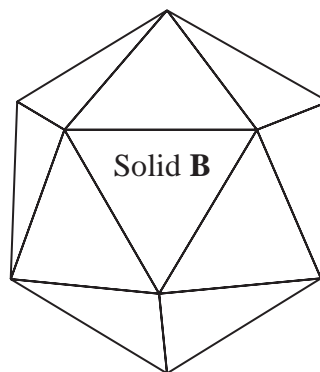


Diagram **NOT**
accurately drawn



Solid **A** is in the shape of a cylinder with radius 3 cm and height 7 cm

Solid **A** has a mass of 2000 g

Solid **B** has a mass of 3375 g

Solid **B** has a volume of 450 cm^3

All of the metal from Solid **A** and Solid **B** is melted down to make a uniform Solid **C**

Given that there is no change to mass or volume during this process

work out the density of Solid **C**

Give your answer correct to one decimal place.

$$\text{volume A} : \pi \times 3^2 \times 7 = 197.9 \dots \text{ (1)}$$

$$\text{density C} : \frac{2000 + 3375}{197.9 \dots + 450} \text{ (1)}$$

$$= 8.3 \text{ (1)}$$

$$\dots\dots\dots 8.3 \dots\dots\dots \text{ g/cm}^3$$

(Total for Question 11 is 3 marks)

12 The diagram shows a solid prism.

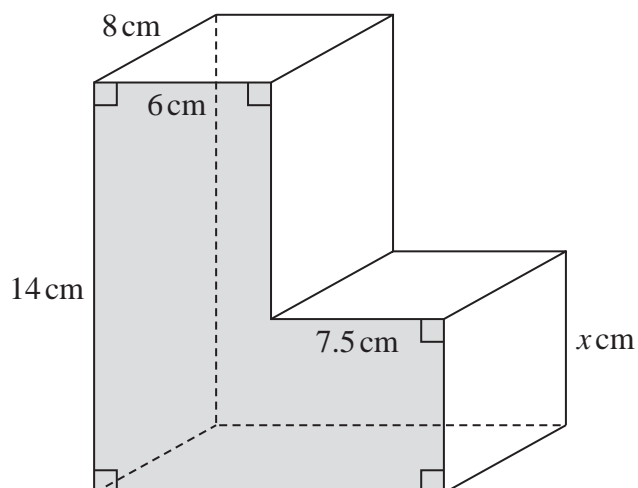


Diagram **NOT**
accurately drawn

The cross section of the prism is shown shaded.

The volume of the prism is 924 cm^3

Work out the value of x

$$\text{Area of shaded region} : (6 \times 14) + (7.5 \times x)$$

$$= 84 + 7.5x \quad (1)$$

$$924 = (84 + 7.5x)8 \quad (1)$$

$$84 + 7.5x = 115.5$$

$$7.5x = 31.5 \quad (1)$$

$$x = 4.2 \quad (1)$$

$$x = 4.2$$

(Total for Question 12 is 4 marks)

13 The diagram shows a rectangular sheet of metal $ABCD$

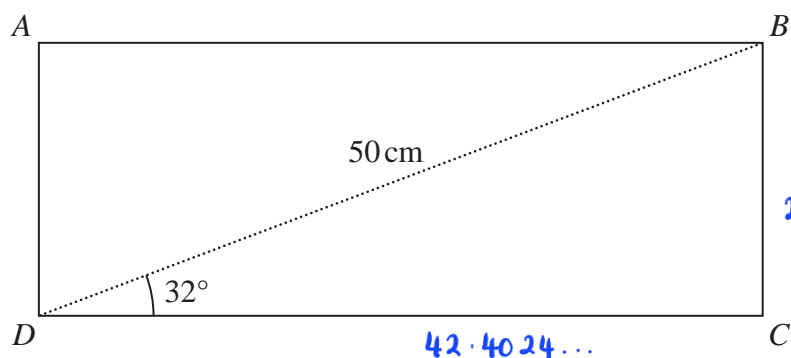


Diagram **NOT**
accurately drawn

$BD = 50$ cm and angle $BDC = 32^\circ$

Nasser joins side AD to side BC to form a cylinder.

BC is the height of the cylinder.

DC is the circumference of the cross section of the cylinder.

Work out the volume, in cm^3 , of the cylinder.

Give your answer correct to 3 significant figures.

$$\sin 32^\circ = \frac{BC}{50} \quad (1)$$

$$BC = 50 \sin 32^\circ = 26.4959... \quad (1)$$

$$\cos 32^\circ = \frac{CD}{50} \quad (1)$$

$$CD = 50 \cos 32^\circ = 42.4024...$$

$$42.4024... = 2\pi r$$

$$r = \frac{42.4024...}{2\pi} = 6.74855... \quad (1)$$

$$\text{Volume} = \pi \times 6.74855...^2 \times 26.4959... \quad (1)$$

$$= 3796 \quad (1)$$

3790

..... cm³

(Total for Question 13 is 6 marks)

- 14 The diagram shows a cuboid.

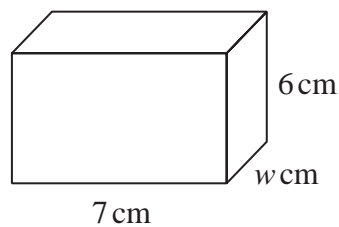


Diagram **NOT**
accurately drawn

The volume of the cuboid is 231 cm^3

- (b) Calculate the value of w

$$7 \times 6 \times w = 231$$

$$42w = 231$$

$$w = \frac{231}{42} = 5.5$$

$$w = \frac{5.5}{(2)}$$

(Total for Question 14 is 2 marks)