

Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
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TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2011

Applications of Mathematics 93702H (Linked Pair Pilot)

Unit 2 Geometry and Measures

H

Tuesday 21 June 2011 9.00 am to 10.30 am

For this paper you must have:

- mathematical instruments.
- You may use a calculator.



Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Question 7.
These questions are indicated with an asterisk (*)
- You may ask for more answer paper, graph paper and tracing paper.
These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.



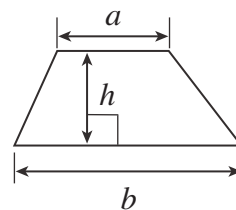
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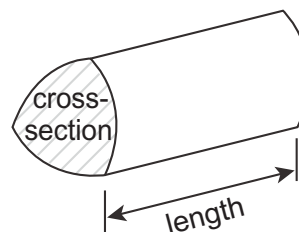
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Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

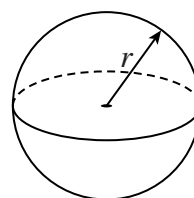


Volume of prism = area of cross-section $\times$ length



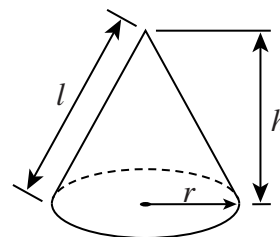
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

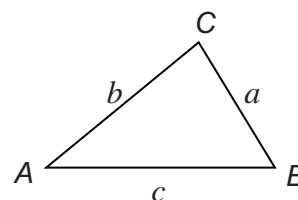


In any triangle ABC

Area of triangle = $\frac{1}{2}ab \sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



The Quadratic Equation

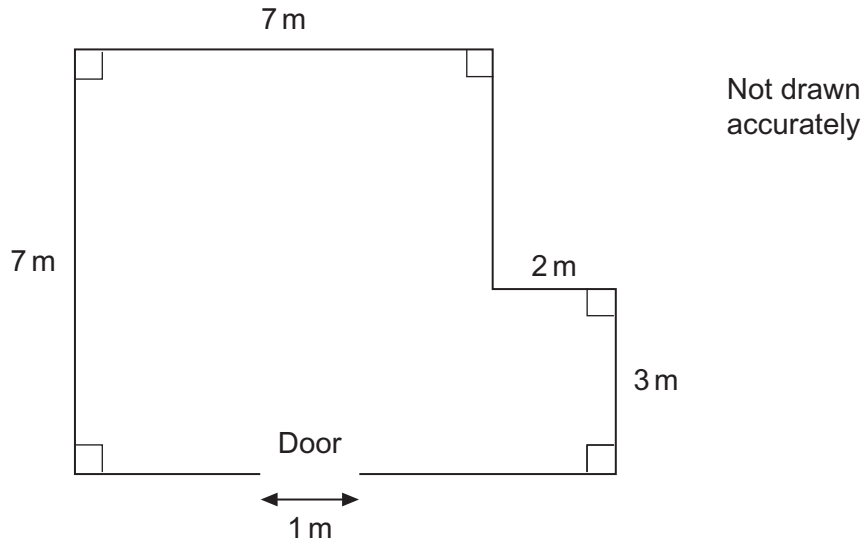
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



Answer **all** questions in the spaces provided.

- 1** Here is the plan of a bedroom floor.



Chloe fits skirting board round the perimeter of the room.
The skirting board is **not** fitted in the doorway.
The door is 1 metre wide.

Work out the total length of the skirting board she needs.

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Answer m (3 marks)

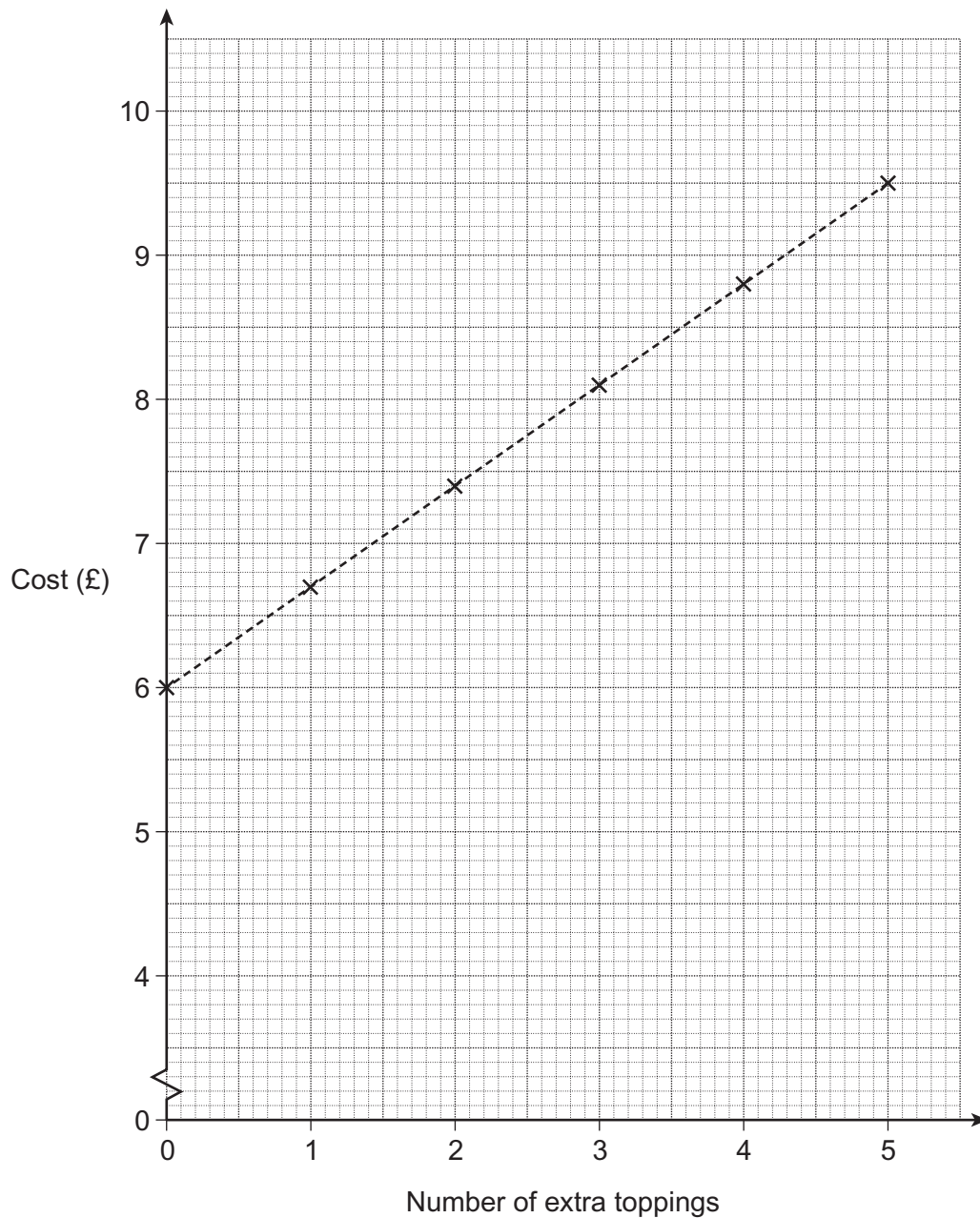


2

A cheese and tomato pizza costs £6 at Mama's restaurant.

Extra toppings on pizzas increase the cost.

The graph shows the cost, in pounds, of a cheese and tomato pizza with up to five extra toppings.



- 2 (a) Work out how much more one extra topping costs.

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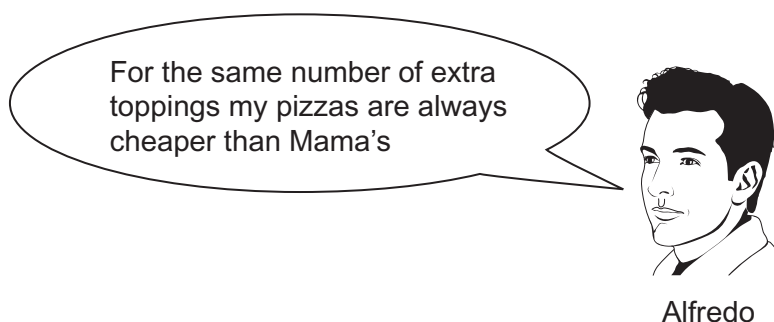
Answer pence (1 mark)

- 2 (b) A cheese and tomato pizza costs £4.80 at Alfredo's restaurant.
Each extra topping costs £1.

Draw a graph to show the cost, in pounds, of a cheese and tomato pizza with up to five extra toppings at Alfredo's restaurant.
Use the grid on the opposite page.

(2 marks)

- 2 (c) Alfredo says



Alfredo

Give an example to show that Alfredo is **not** correct.

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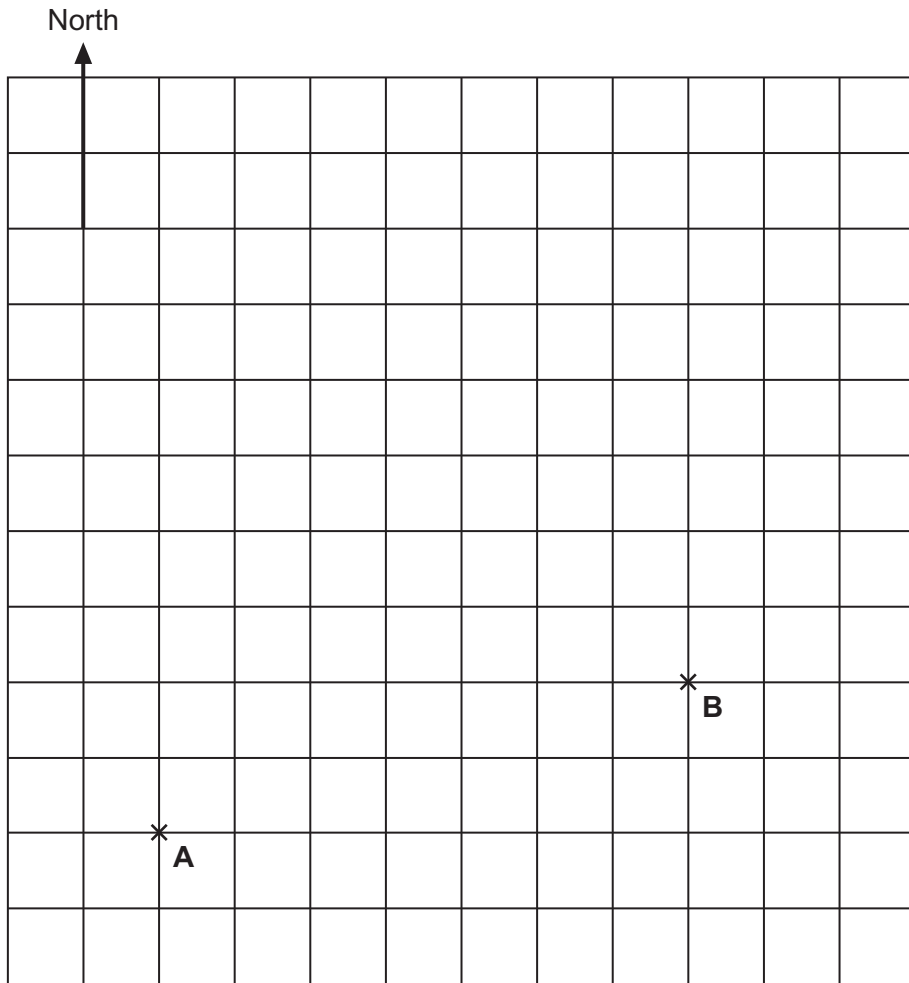
(1 mark)

Turn over for the next question



3

The scale diagram shows the positions of Ship A and Ship B at 10:00



Scale: 1 centimetre represents 2 kilometres

3 (a)

Ship A is travelling on a bearing 060°
 Ship B is travelling on a bearing of 315°
 The ships are travelling at the same speed.

Draw accurate lines on the grid to show the movement of the ships.

Will the ships hit each other?
 Give a reason for your answer.

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(3 marks)

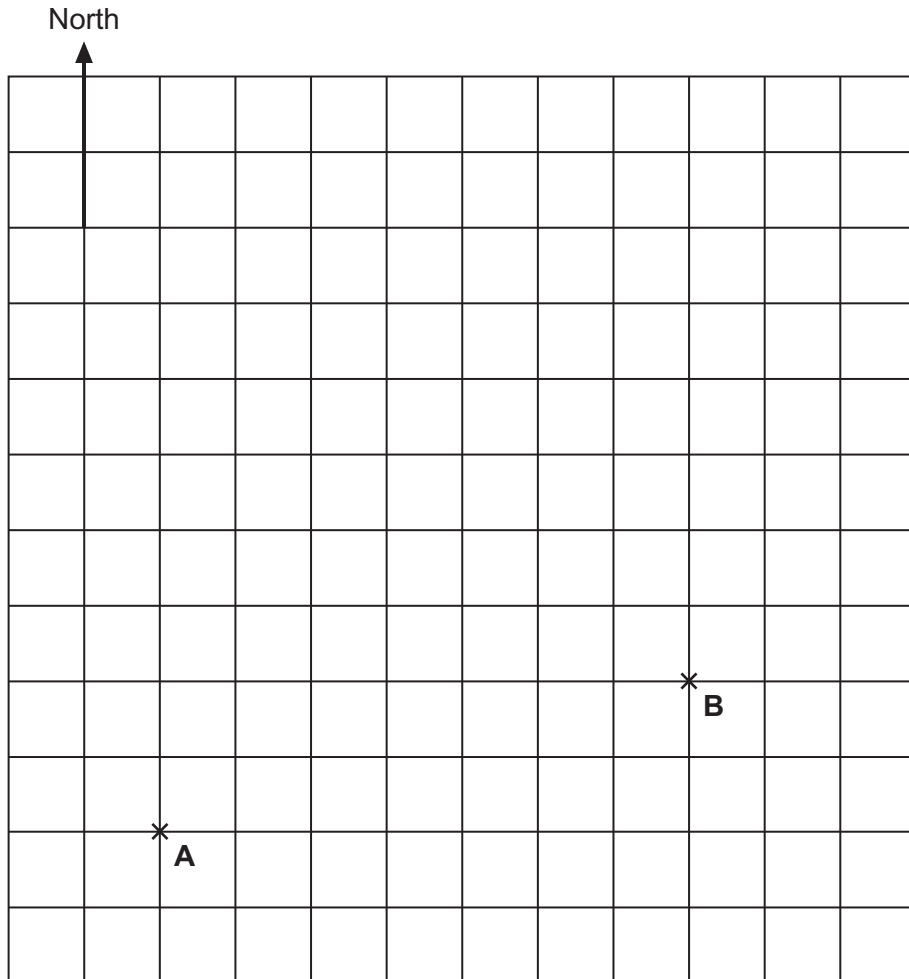


3 (b)

The scale diagram is redrawn below showing the positions of the ships at 10:00
A lighthouse is 20 km from Ship A and 12 km from Ship B.

Use a ruler and compasses to find the position of the lighthouse.
Label the lighthouse, *L*.

Scale: 1 centimetre represents 2 kilometres



(3 marks)

Turn over for the next question



- 4 (b)** The table shows the cost of the materials.

Item	Cost
Small bead	5p
Large bead	9p
Bracelet chain	87p
Necklace chain	£2.84

A shop buys 200 bracelets.

Sammy makes 85% profit on the cost of the materials.

Work out the amount that the shop pays for the bracelets.

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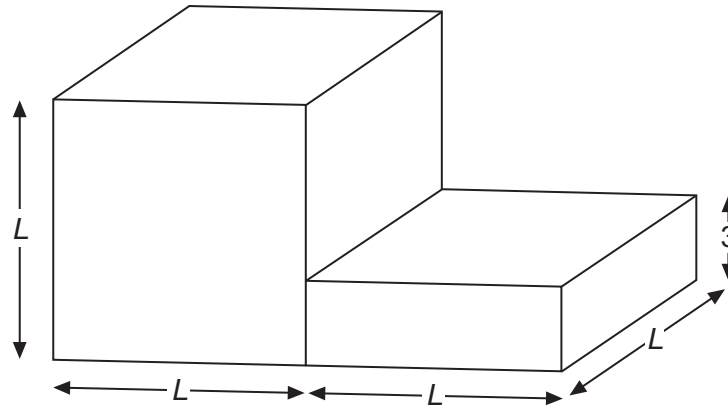
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Answer £ (5 marks)



- 5 A company makes a paperweight.
The paperweight is made from a cube and a cuboid.



The formula for the volume, $V\text{cm}^3$, of the paperweight is

$$V = L^3 + 3L^2$$

The volume of the paperweight is 172cm^3 .

Use trial and improvement to work out the value of L .

The first trial has been done for you.

Give your answer to one decimal place.

L	$L^3 + 3L^2$	Comment
4	112	Too small

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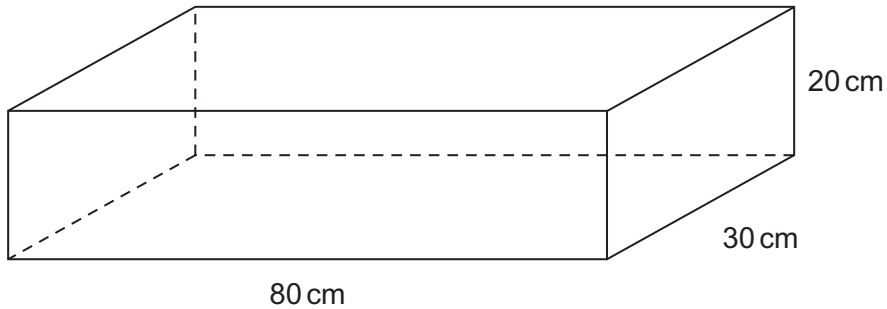
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Answer $L =$ cm (4 marks)



- 6 Amir makes wooden boxes for plants.
The boxes are cuboids.
They do not have lids.



Amir paints the **outside** of each box.
He has one tin of paint that covers an area of 4.5 m^2 .

How many boxes can Amir completely cover with one tin of paint?
You **must** show your working.

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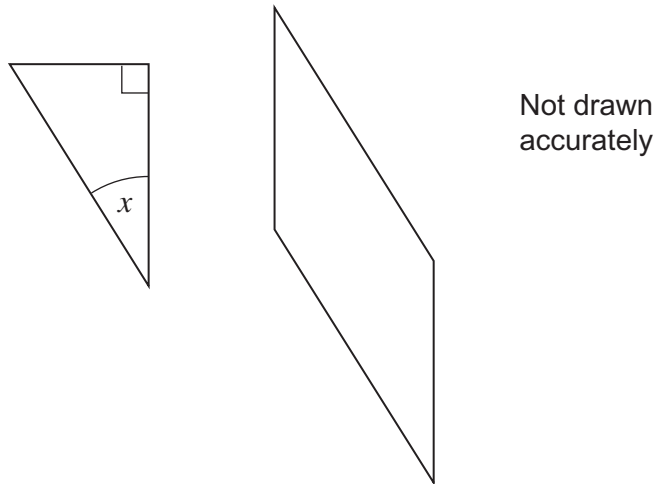
Answer (5 marks)

Turn over for the next question



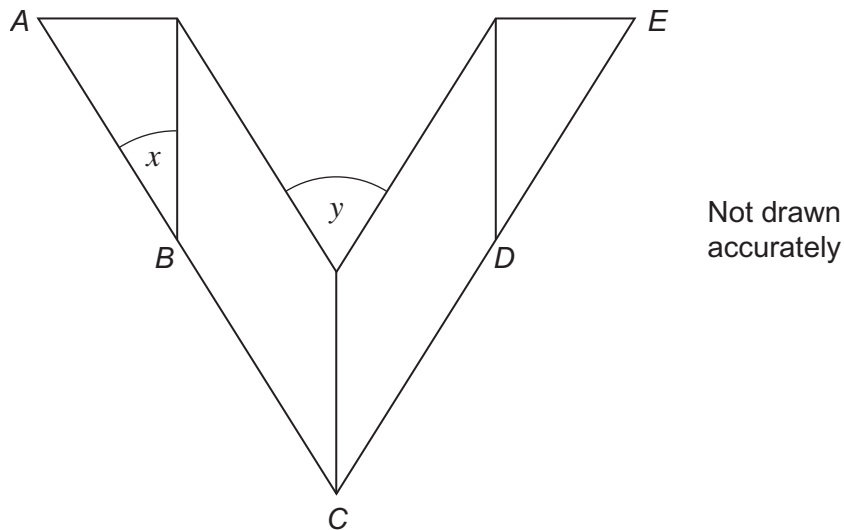
***7**

A designer is making shapes with right-angled triangles and parallelograms.



The obtuse angle in the parallelogram is four times the size of the smallest angle, x , in the triangle.

The designer uses the parallelogram and triangle to make a symmetrical logo.



7 (a) (i) ABC and CDE are straight lines.

Write down and solve an equation to work out the size of angle x .

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Answer degrees (4 marks)



7 (a) (ii) Work out the size of angle y .

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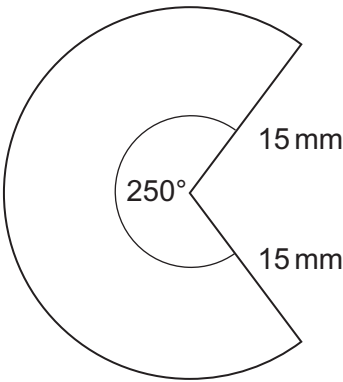
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Answer degrees (3 marks)

7 (b) The designer also makes silver earrings.
The cross-section of an earring is a sector of a circle of radius 15 mm as shown.



Not drawn
accurately

The earring is 3 mm thick.
Work out the volume of silver needed for an earring.

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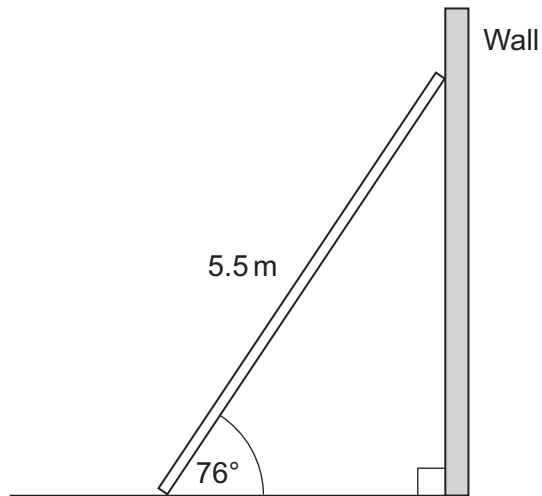
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Answer mm³ (5 marks)



- 8 The diagram shows a ladder leaning against a wall.
The ladder is 5.5 metres long.



Not drawn
accurately

Safety recommendations say that the angle between the ladder and the ground is 76° .

Work out how far up the wall the ladder reaches.

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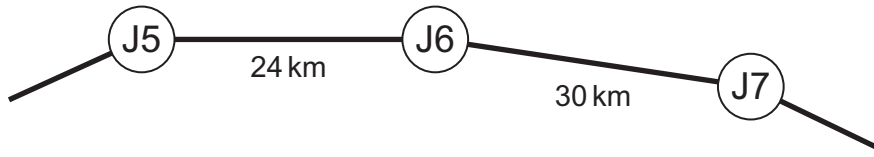
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Answer m (3 marks)



- 9 (a) The map shows distances between some junctions on a motorway.



A car is travelling at a constant speed on the motorway.
The car travels between J5 and J6 in 20 minutes.

How many minutes does it take to travel between J6 and J7?

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Answer..... minutes (3 marks)

- 9 (b) Mel is going to hire a car.
He will have to pay for the petrol that he uses.

Car A travels 48 miles for each gallon of petrol used.
Car B travels 15 kilometres for each litre of petrol used.

Which car should he choose so that he spends less on petrol?
You **must** show your working.

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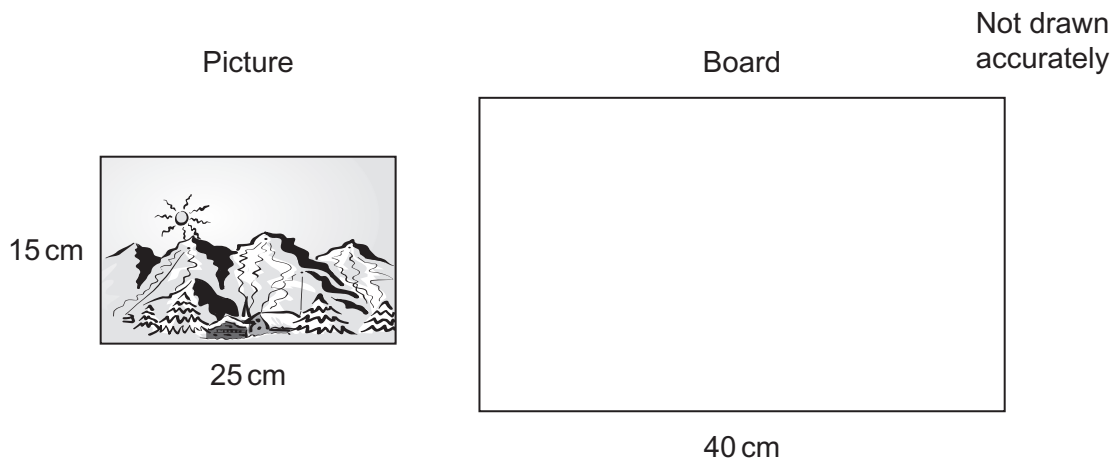
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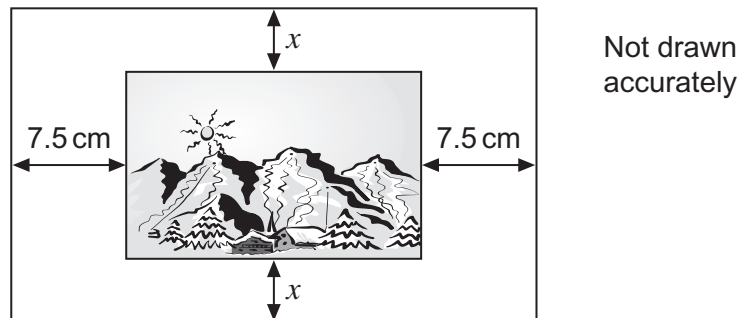
Answer (3 marks)

10

A rectangular picture has length 25 cm and width 15 cm.
A rectangular board has length 40 cm.



The picture is placed on the board as shown.



The picture and the board are similar shapes.

Work out x .

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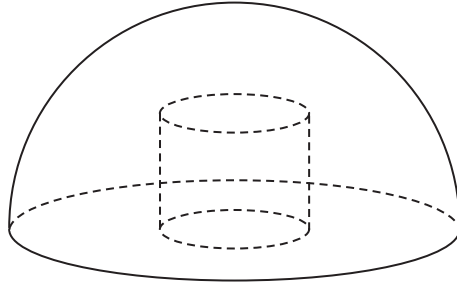
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Answer cm (4 marks)

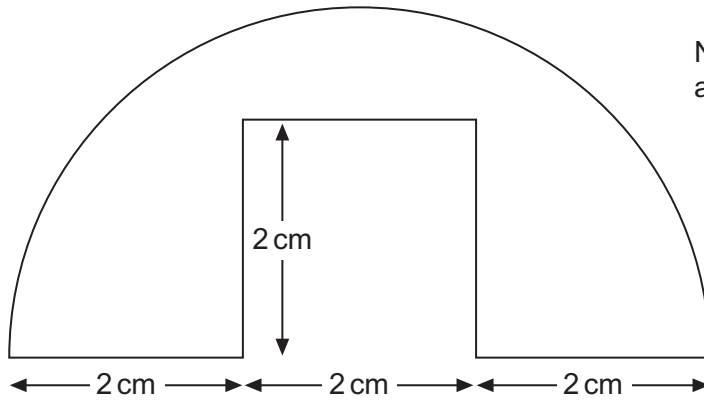


11

A lid for a perfume bottle is made by removing a solid cylinder from a solid hemisphere.



A cross section of the lid is shown.



Not drawn
accurately

Work out the volume of the lid.
You **must** show your working.

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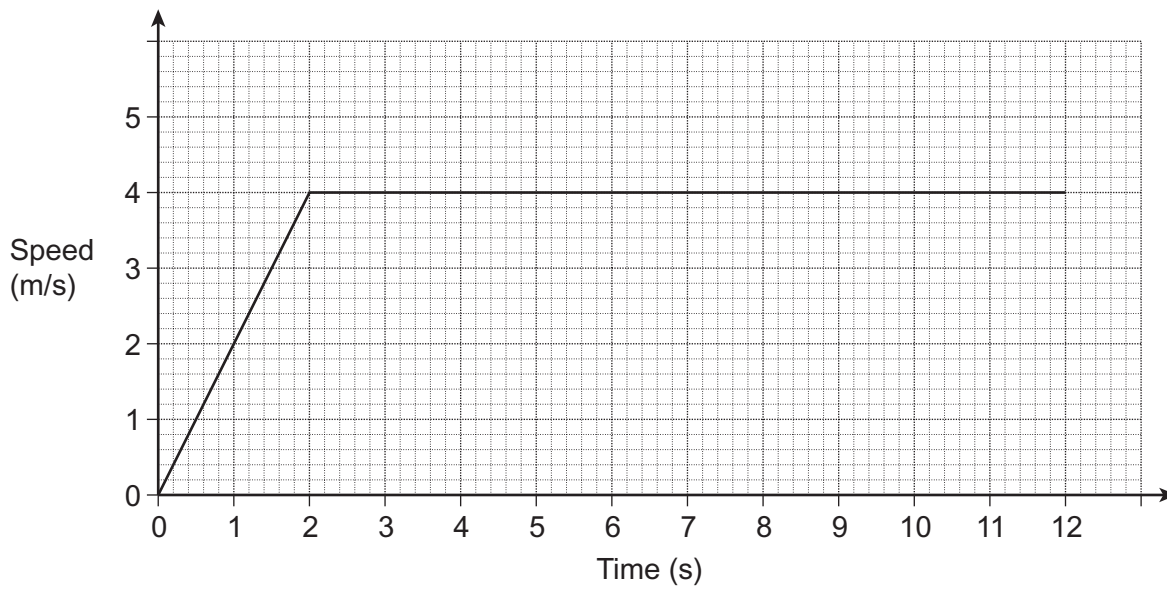
Answer cm^3 (4 marks)



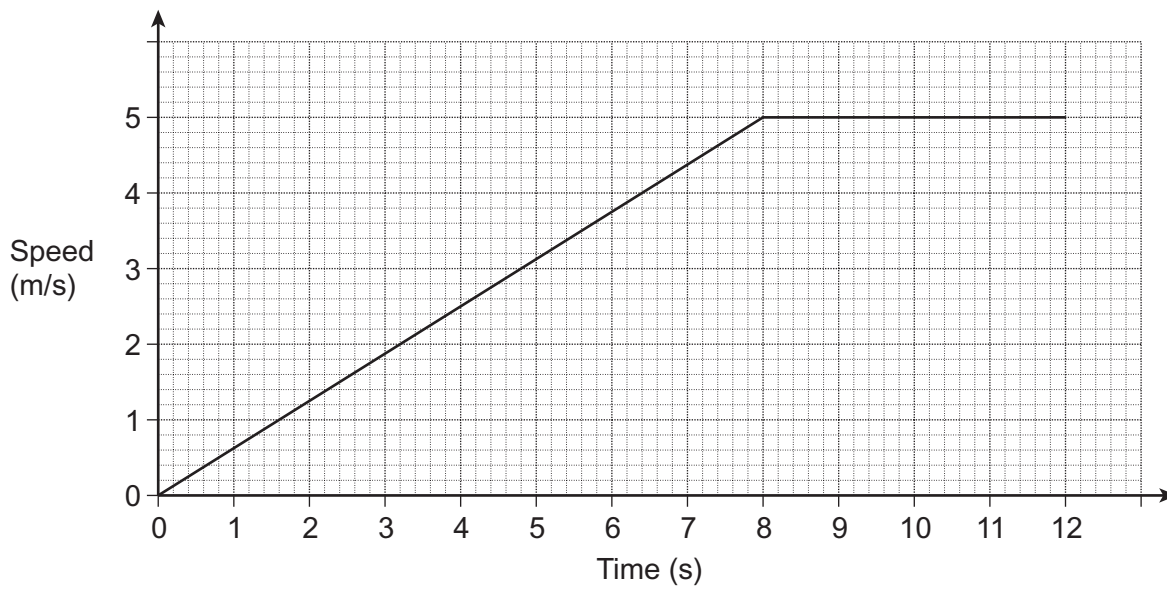
12

Amy and Sue run a race.
The race is won in exactly 12 seconds.

The graph shows Amy's speed in metres per second.



This graph shows Sue's speed in metres per second.



Who won the race?

You **must** show your working and give reasons for your answer.

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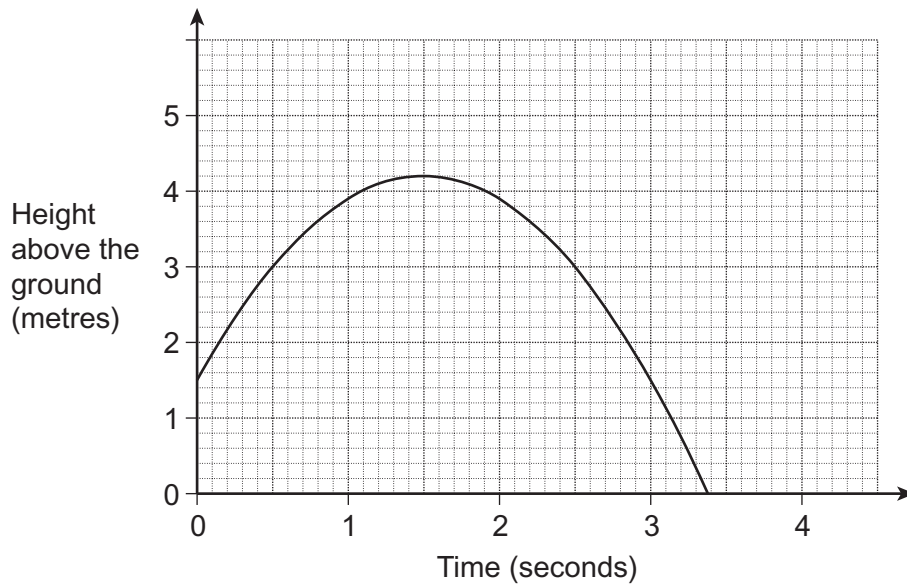
Answer (5 marks)

Turn over for the next question



13 Sachin throws a ball.

The graph shows the height of the ball above the ground, in metres, after he throws it.



13 (a) How high above the ground is the ball when Sachin throws it?

Answer m (1 mark)

13 (b) After how many seconds does the ball hit the ground?

Answer s (1 mark)

13 (c) For how many seconds is the ball more than 3 metres above the ground?

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Answer s (2 marks)



- 13 (d) (i)** Work out an estimate of the gradient of the graph one second after Sachin throws the ball.

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Answer (3 marks)

- 13 (d) (ii)** What does this gradient represent?

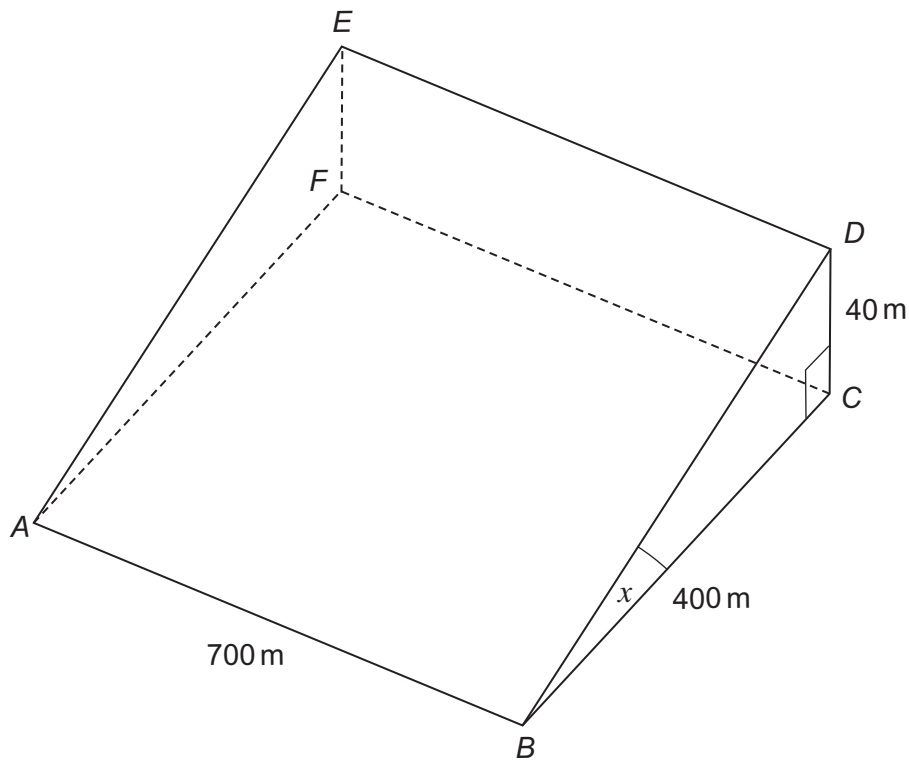
Answer (1 mark)

Turn over for the next question



14

$ABCDEF$ is a triangular prism.
 $ABCF$ is a rectangular horizontal plane.
 Angle $BCD = 90^\circ$



The prism represents part of a hill on a cycle track.

14 (a)

Vic cycles in a straight line from B to D .
 Work out the angle at which he climbs (marked x on the diagram).

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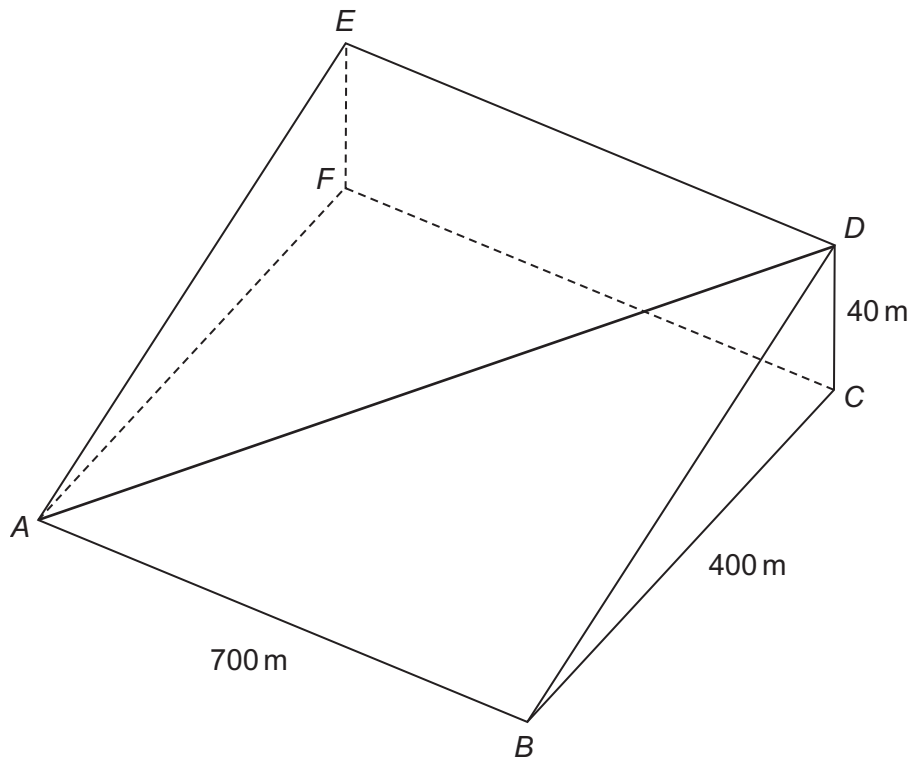
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Answer degrees (3 marks)



- 14 (b)** Liz cycles in a straight line from A to D .



Show that the angle at which Liz climbs is about half the angle at which Vic climbs.

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(5 marks)

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

