Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications

HIGHER TIER

A.M. THURSDAY, 23 January 2014

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **6***(b)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**7**	
3.	**6**	
4.	**6**	
5.	**8**	
6.	**13**	
7.	**12**	
8.	**5**	
9.	**4**	
10.	**9**	
11.	**10**	
12.	**7**	
13.	**5**	
14.	**6**	
Total	**100**	

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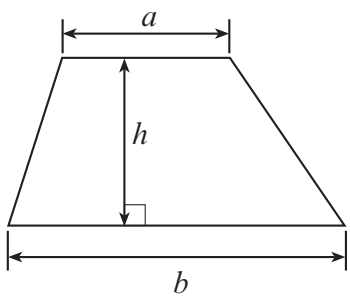
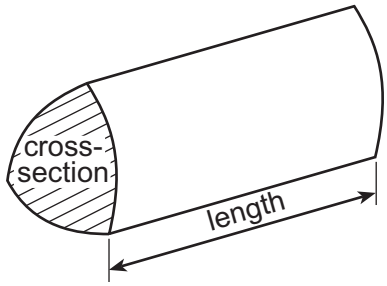
Formula List

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

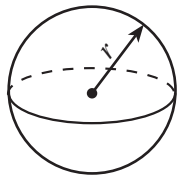


Volume of prism = area of cross-section × length



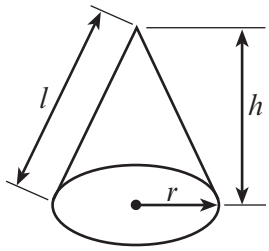
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

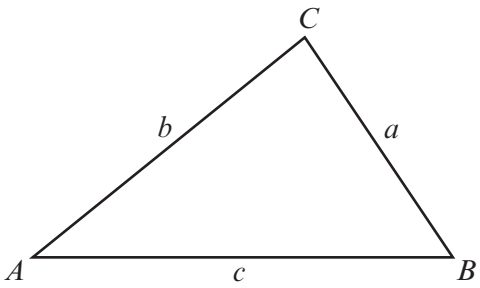


In any triangle ABC

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

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

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



The Quadratic Equation

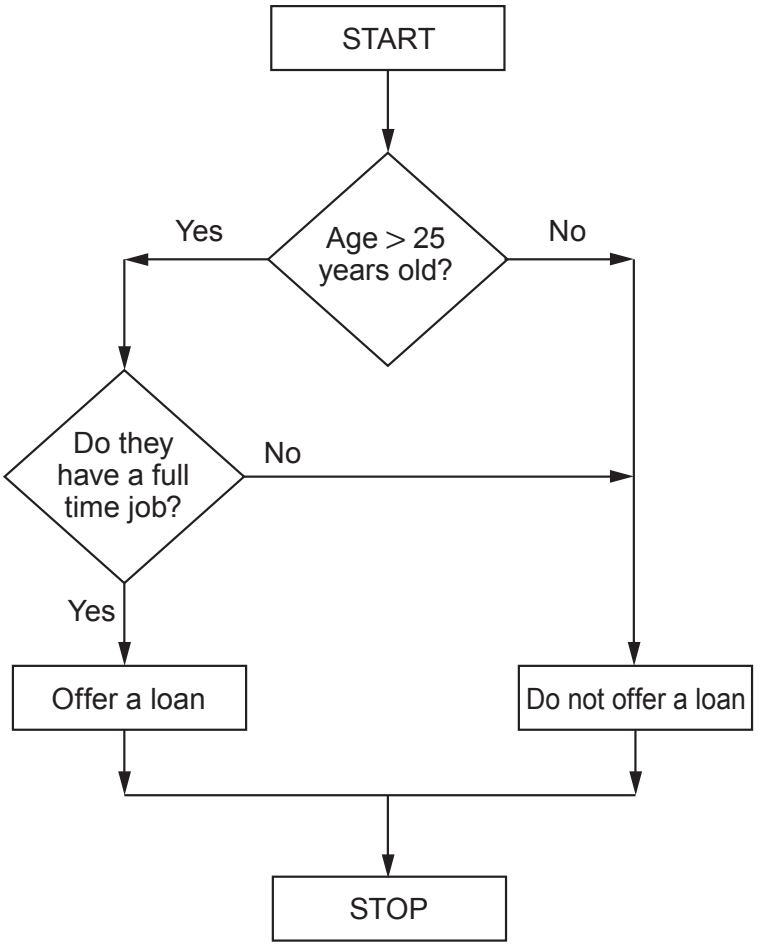
The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Examiner only

1. A bank uses this flowchart to decide if a customer would be offered a loan.



Which of the people below would **NOT** be offered a loan by the bank? [2]

- Mr Roberts, aged 45 working one evening per week as a salesman
- Miss Evans, aged 25 working full time as a nurse
- Mr Thomas, aged 26 working full time as a mechanic
- Miss Abbott, aged 26 working part time as a plumber
- Mr Brett, aged 86 retired
- Miss White, aged 42 working full time as a teacher

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Examiner only

2. Kenny is making templates of digits to stick on birthday cards.
A birthday card could show any age using stickers.

(a) Kenny has printed three versions of the digit 4.

Version A: **4** Version B: **4** Version C: ***4***

(i) What needs to be done to version A to make it congruent to version B? [1]

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(ii) Explain why version A is **not** similar to version C. [1]

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Examiner only

(b) Kenny decides not to make a digit 9 sticker.
He says that it can be made using the digit 6 sticker.
What needs to be done to the digit 6 sticker to make it look like a digit 9 sticker? [2]

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(c)

In making the digit 3 stickers, Kenny knows that:

- two-sevenths of the stickers will be wasted due to not printing accurately, and
- one-eighth of the remaining stickers will be wasted due to not placing them on cards correctly.

Calculate the fraction of the digit 3 stickers that are **not** wasted. [3]

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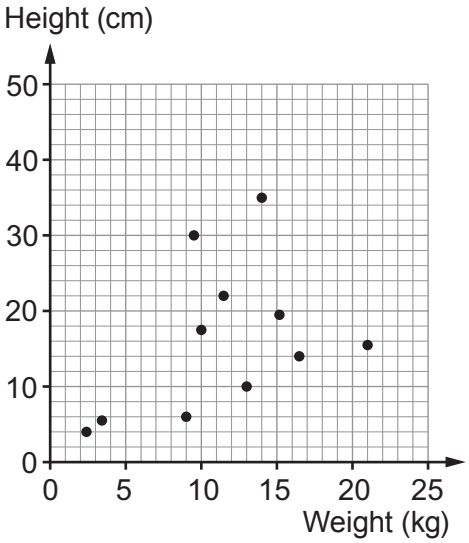
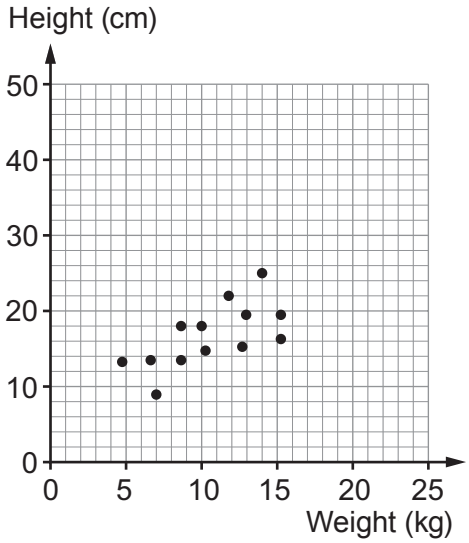
Examiner only

3. Bethany and Michelle have both completed a project about pets.
They weighed and measured the heights of a number of pets.
They each drew a scatter diagram showing their results.

Bethany's scatter diagram



Michelle's scatter diagram



(a) One of the girls' scatter diagrams shows weights and heights of pet cats, dogs and hamsters.
The other girl's scatter diagram shows weights and heights of only pet cats.

Which of the girls, Bethany or Michelle, considered only pet cats?
Give a reason for your answer. [1]

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(b) Draw a line of best fit, by eye, on Michelle's scatter diagram. [1]

Examiner only

(c) Carl also completed a project about pets.
He decided to weigh all his friends' pets.

Carl says

> Girls usually keep pets that weigh less than the pets that boys keep

The stem-and-leaf diagram shows the results of Carl's survey.

Weight of boys' pets (kg)		Weight of girls' pets (kg)
2 1	4	
1 1	3	2
3 2 1	2	2 3 5 9 9
5 3	1	1 3 4 6 8
8 7 4 2 2 2	0	7 9

Key: Boys' pets 3 | 2 means 23 kg
Girls' pets 3 | 2 means 32 kg

By finding each of the mode, median and range for the weights of the boys' pets and the weights of the girls' pets, decide if Carl is correct.
You must show all your working and give a reason for your decision. [4]

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Examiner only

4.

Ingredients to make
4 pancakes

55 g plain flour
1 egg
100 ml milk
37·5 ml water
25 g butter

Useful information, metric and imperial units:

4 ounces is approximately 110 g
25 ml of milk or water is approximately 1 fluid ounce

(a) Using the recipe shown above, calculate the quantity of plain flour needed to make 48 pancakes. **Give your answer in ounces.** [3]

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(b) Jerry works in a school kitchen.
She uses the recipe information for pancakes shown above.
She has measured out the plain flour, milk and butter and placed them with the eggs in a large bowl.
Jerry measures out 150 fluid ounces of water to add to her other pancake ingredients in the bowl.
How many pancakes is Jerry making? [3]

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Examiner only

5. *(a)* Eleri spent £1220.18 on diesel for her car last year.
Given the information below, calculate how many miles Eleri travelled in her car last year.
Give your answer correct to 3 significant figures.

- 1 gallon is approximately 4·55 litres.
- The average cost of diesel last year was £1.69 per litre.
- On average, Eleri's car does 42·9 miles per gallon. [5]

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(b) The fuel tank in Dewi's car holds 80 litres.
What is the capacity of Dewi's fuel tank in m^3? [3]

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Examiner only

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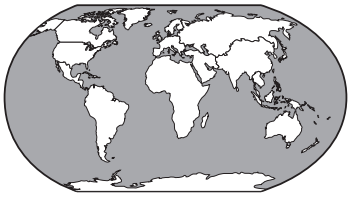
FREE-WORLD TRAVEL



(a) *Free-world Travel* is due to publish a summary report about people and their holidays in their newsletter.
One hundred *Free-world Travel* customers are completing a short questionnaire about their holidays as shown below.

Holiday questionnaire

1. What is your age? .....
2. How many holidays have you had this year? .....
3. How many days have you spent on holiday in total this year? .....
4. What type of holiday do you prefer? .....

A data-collection sheet is to be used to summarise the data.

(i) Design a data-collection sheet that could be used to summarise the customers' responses.
You must plan to group the data when appropriate. [4]

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Examiner only

(ii) Why is grouping data useful when collating data? [1]

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(b) *You will be assessed on the quality of your written communication in this part of the question.*

Free-world Travel charges each customer £130 for travel insurance.
Last month, *Free-world Travel* had 6000 customers.

Free-world Travel has previously noticed that 80% of its customers buy holiday insurance.
Of these customers, approximately 30% claim on their travel insurance.
Free-world Travel typically pays out between £400 and £500 for each claim.

Free-world Travel needs to estimate how much profit or loss they are likely to make from travel insurance last month.
Calculate this estimate.
You must show all your working. [8]

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Examiner only

7. Siwan has an online business, *'e-buy-your-veg'*.

The business buys vegetables and sells them through a website on the Internet.
The only costs to the business are for paying the suppliers and for package and delivery.

The table below is the summary *'e-buy-your-veg'* keeps, showing financial data for each of three months.

Month	Costs		Payment from Customers, £	Profit, £
	Suppliers' bill, £	Package and delivery, £		
June	34 400	3 100	56 725	19 225
July	26 850	2 760	42 150	12 540
August	23 560	2 610	25 680	–490

(a) In which month did *'e-buy-your-veg'* make the greatest profit as a percentage of costs?
Your must show all your working to justify your answer. [3]

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(b) Siwan's business plan has a target of making a profit of fifty thousand pounds for the next three months.
Her business *'e-buy-your-veg'* makes a profit of £3.2×10^4 for this period.
By how much is Siwan's profit short of meeting the target?
Give your answer in standard form. [3]

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Examiner only

(c) Siwan is considering the initial cost of some parsnips.

The initial cost of an order is the price paid to the supplier plus the amount paid for package and delivery.

Siwan charged £24.30 for an order of parsnips.
Siwan made a 35% profit on the order.
Calculate the initial cost of the order. [2]

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(d) Siwan's friend, Tim, started his own Internet sales business.
Tim made a profit of £1.7×10^4 in the first month.
The profit doubled every month for the next three months.
Calculate the **total** profit Tim made in the first four months.
Give your answer in standard form. [4]

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Examiner only

8. Evan is an assistant engineer.

(a) Evan has been asked to write down an equation to work out the total perimeter of any regular polygon.
The total length of the perimeter is P cm, the number of sides the regular polygon has is n, and each side measures s cm.
Write down an equation in terms of P, n and s. [1]

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(b) Evan is out with his boss taking measurements.
These measurements lead to a pair of simultaneous equations.

$$3g + 4h = 8$$
$$5g - 6h = 7$$

Evan is asked by his boss to solve these equations.

Solve the simultaneous equations shown above using an algebraic method. [4]

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Examiner only

9. Linden measures the flow of water out of a pipe.

He records the number of litres correct to the nearest 10 litres.
He records the time correct to the nearest second.

Linden reports that 300 litres of water flow out of the pipe in one minute.

Calculate the maximum rate at which the water could be flowing out of the pipe in litres per second. Give your answer correct to 3 decimal places. [4]

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Examiner only

10. *(a)* Ffion thinks that if interest is paid monthly then the AER% rate is always higher than the Gross annual % rate.

Explain why Ffion is correct. [1]

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(b) *Haygreen Building Society* offers customers a range of savings accounts.

(i) The Gross annual interest rate on the **Mega Plus** savings account is 4·8%, with the interest payable monthly.
Calculate the monthly interest rate payable on the **Mega Plus** savings account. [1]

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(ii) Ffion decides to open a **Gold** savings account on the 1st May.
The interest is paid at a rate of 0·3% per month.
She invests £200 in the account.
She leaves the account without withdrawing from or making payments into her account for 5 months.
Calculate the balance that would be shown on Ffion's **Gold** savings account statement after this five-month period. [3]

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Examiner only

(iii) *Haygreen Building Society* has another savings account, **Save & Grow**.
This account allows a fixed amount of money to be invested for a 12-month period.
Withdrawals or further investments are not allowed.
The monthly interest rate is 1·2%.

A spreadsheet is used to calculate the balance on the **Save & Grow** savings account every month.

Gareth invests £400 in a **Save & Grow** savings account.
An example of the spreadsheet used to calculate the balance in Gareth's account each month is shown below.

A	B	C	D	E	F
1	Amount invested £		Monthly interest rate %	Period of investment, x months	Balance after x months
2	400		1·2		
3				1	.....
4				2	
5				3	
6				4	
7				5	
8				6	
9				7	
10				8	
11				9	
12				10	
13				11	
14				12	.....

Write down the formula, using cell references, which could be used to calculate the amount for each of the following cells.

F3

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= ..... [2]

F14

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= ..... [2]

Examiner only

11. Thelma owns a Guest House.
She wants to buy a number of rugs and cushions.

Each rug costs £30 and each cushion costs £4.

Thelma has decided on some conditions.

- She wants to buy at least 5 rugs.
- The number of cushions she buys must be less than twice the number of rugs she buys.
- She has a budget of £300.

Let r represent the number of rugs and let c represent the number of cushions.

(a) Write down three inequalities that satisfy Thelma's conditions. [4]

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(b) Use the graph paper opposite to find the region that is satisfied by all three inequalities. [4]

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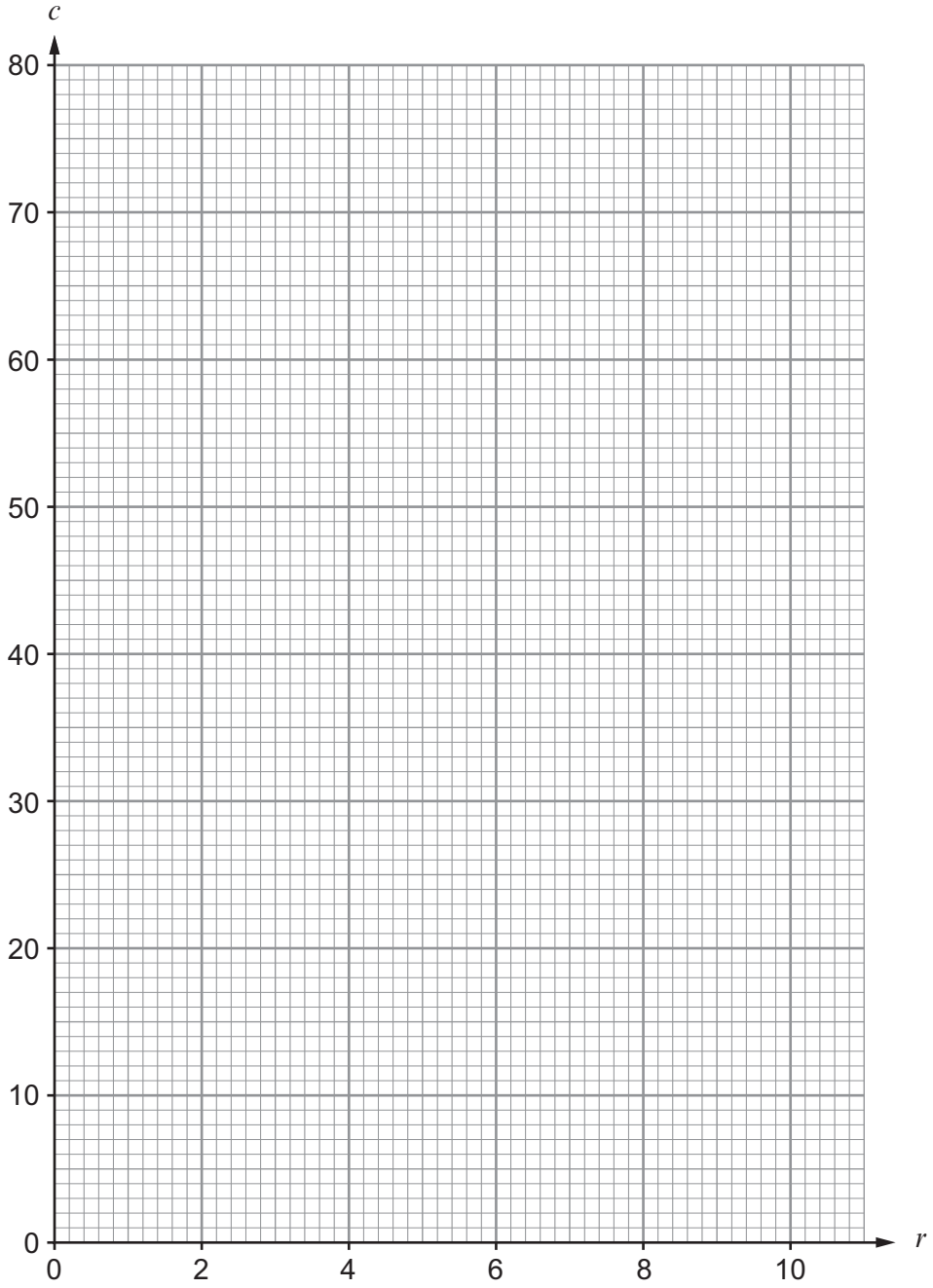

(c) Thelma buys the maximum possible number of cushions, keeping to her conditions. Find the number of rugs and cushions she buys and the total cost. [2]

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Number of rugs = ...

Number of cushions = ...

Total cost = £ .....

Examiner only

12. A van driver for a delivery company delivers a package in the shape of a triangular prism. The cross-section of the package is a right-angled triangle.

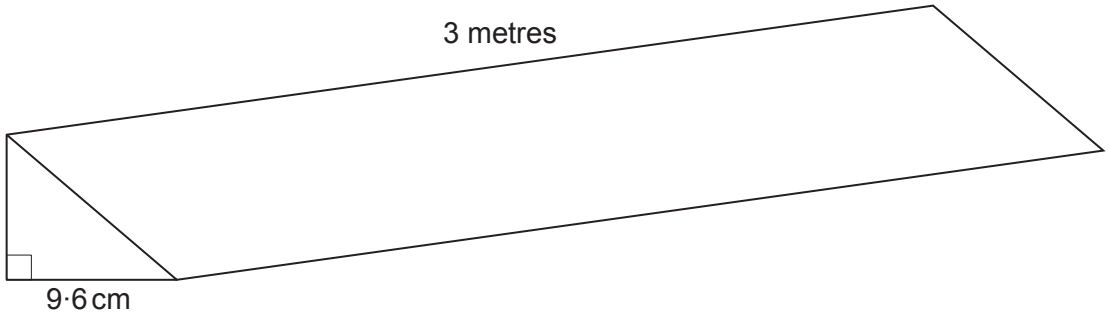

Diagram not drawn to scale

The delivery note states that the volume of the package is 5400 cm^3.
The van driver has to complete a confirmation note stating the lengths of all the sides of the cross-section and the length of the package.

Confirmation note:

Right-angled triangle:

base: 9·6 cm height: ..... cm hypotenuse: ..... cm

Length of package: ..... cm

Complete the confirmation note by calculating the three missing lengths.
Give your answers in centimetres correct to one decimal place. [7]

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Examiner only

13. Nia wants to calculate the angle of elevation of the roof of her dog's kennel.
She has noticed that the front of her dog's kennel is symmetrical.

She has measured a number of lengths and recorded them on a photograph of the kennel as shown below.

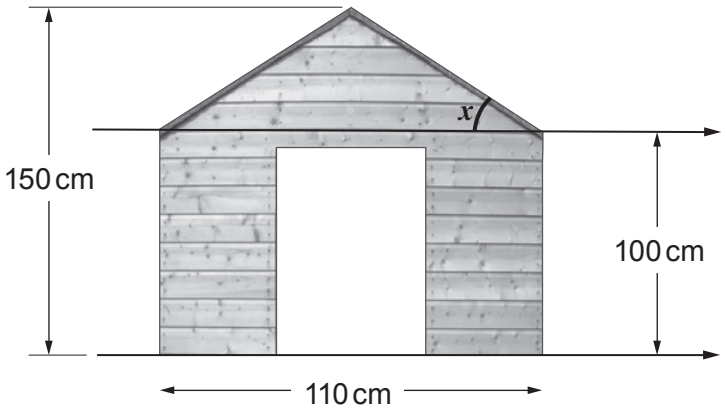

Diagram not drawn to scale

Nia has marked the angle of elevation with an x on the photograph.
Calculate the size of angle x to an appropriate degree of accuracy. [5]

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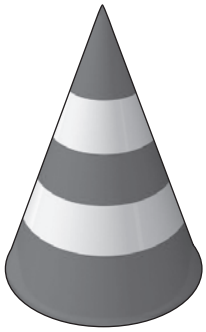
14. A car dealer asks a company specialising in manufacturing metal artwork to make a hollow metal traffic cone.



The hollow metal traffic cone is made by pouring molten metal into a mould.
A sketch of the design plan is shown below.

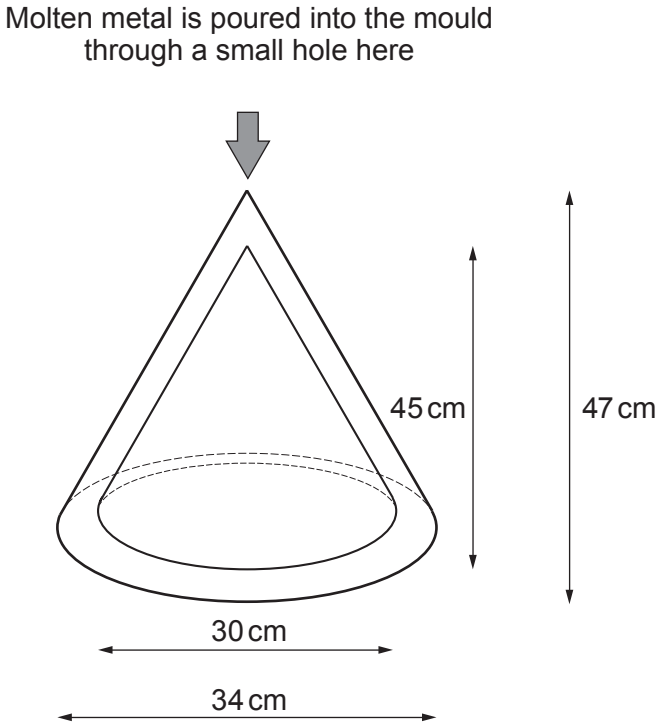


Diagram not drawn to scale

The mould is made using an outer cone of diameter 34 cm and height 47 cm, with an inner cone of diameter 30 cm and height 45 cm.
The outer and inner cones stand on a horizontal circular base.

Examiner only

Calculate the volume of metal in the finished traffic cone.
Give your answer in litres correct to 3 significant figures. [6]

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END OF PAPER