WJEC GCSE APPLICATIONS OF MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 2 HIGHER TIER 4362 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

S16-4362-02-R1

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications
HIGHER TIER

P.M. THURSDAY, 16 June 2016

2 hours

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

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020001

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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.

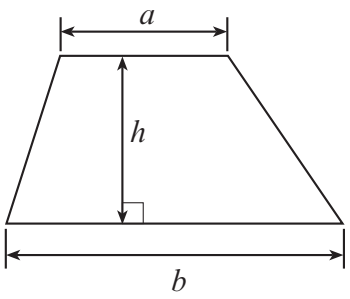
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **4***(b)*(i).

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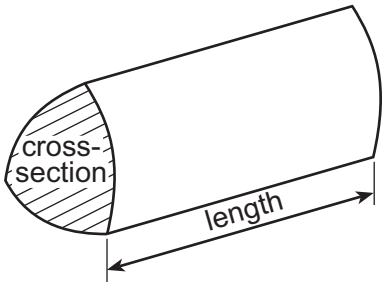
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Formula List

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

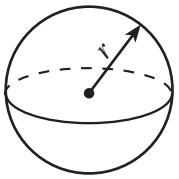


Volume of prism = area of cross-section × length



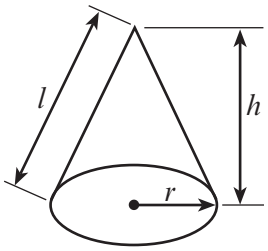
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

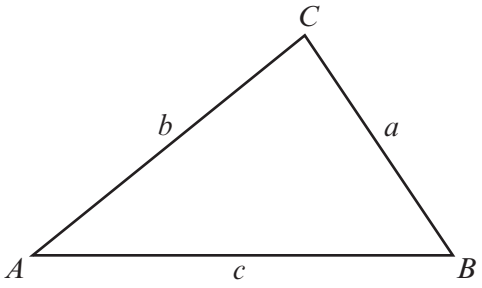


In any triangle ABC

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

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

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1. Approximately 1000 bikes are stolen every day across England and Wales.



AlliedWheels Insurance insists that insurance policy holders spend 9% of the value of their bike on purchasing two locks:

- a D-lock for the frame, and
- a flexible lock for the wheels.

Lili's bike is worth £349.
Her bike is insured by *AlliedWheels Insurance*.

Which two of the following locks should she buy to **exactly** satisfy her insurance company's conditions?
You must show all your working. [3]

D-locks			
 Lock 1 £16.34	 Lock 2 £17.25	 Lock 3 £14.67	 Lock 4 £20.45
Flexible locks			
 Lock 5 £12.34	 Lock 6 £15.07	 Lock 7 £6.45	 Lock 8 £4.56

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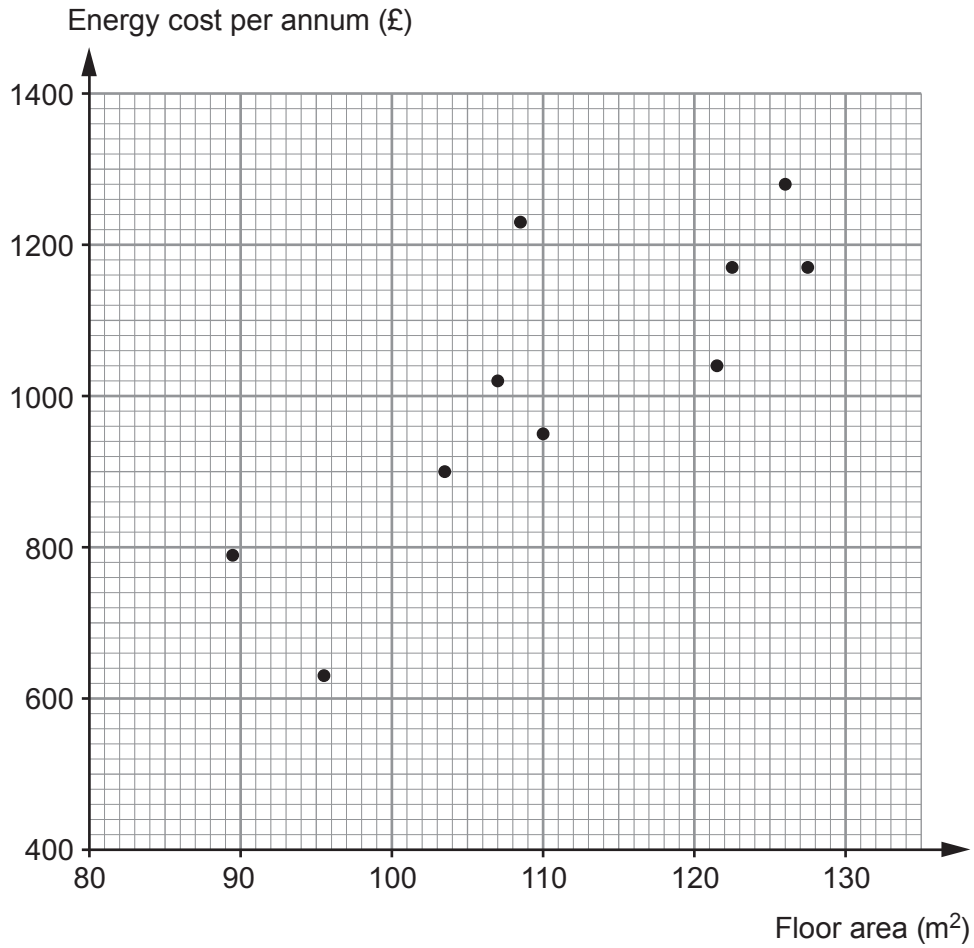
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2. Rowena and Wilf each collected information about the floor area of a number of flats in different villages and the related energy cost per annum.

They each displayed their information in a scatter diagram.

Rowena's scatter diagram

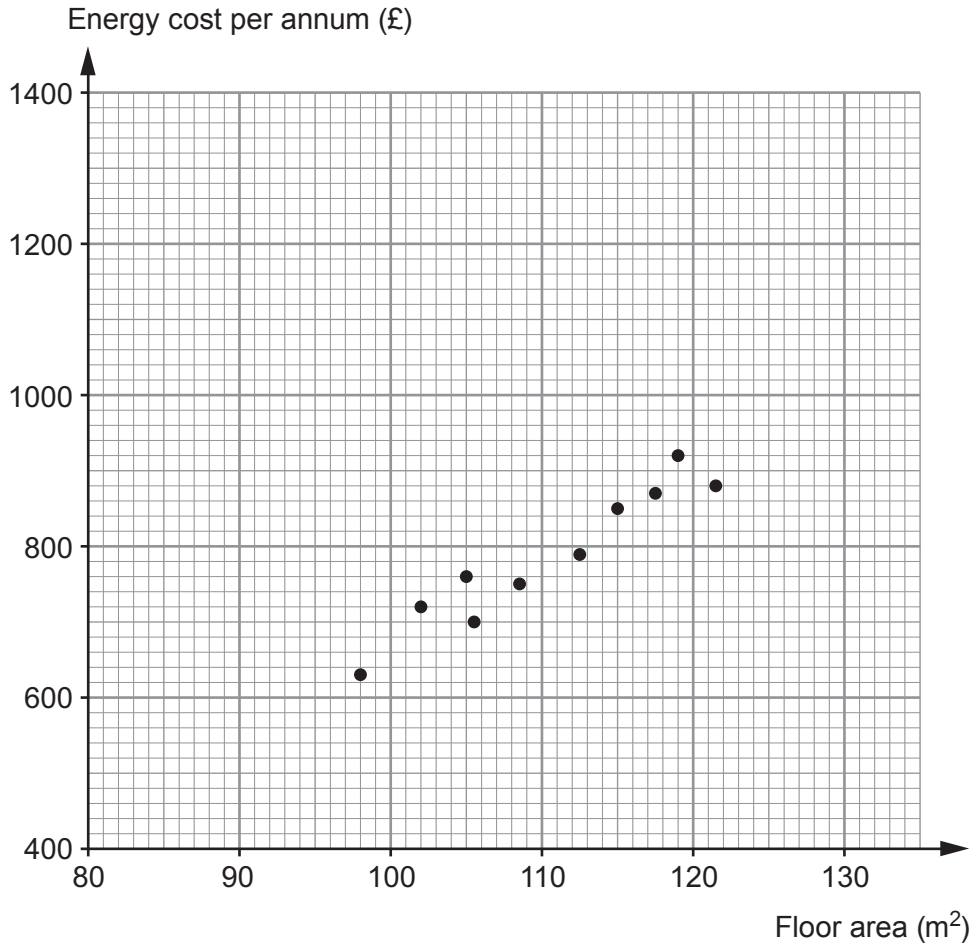


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Wilf's scatter diagram



(a) By considering the information collected by both Rowena and Wilf, what is the floor area of the flat with the highest energy cost? [1]

..... m^2

(b) Who drew the scatter diagram showing the strongest correlation?

Rowena ☐ Wilf ☐

You must give a reason for your answer. [1]

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

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Turn over.

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(d) *Heat-in* is a company that installs insulation.
Heat-in makes the following claim.

> Make huge savings on your heating bills by insulating your flat.

Heat-in has insulated the flats in only one of these villages.
One of the scatter diagrams shows flats that have been insulated by *Heat-in*.

(i) Whose scatter diagram is this more likely to be?
You must give a reason for your answer. [1]

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(ii) A newspaper headline says:

> The smaller your flat, the more you save by insulating it.

From the information in the scatter diagrams, would you suggest this headline is possibly true or not?
You must give a reason for your answer. [1]

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3. *(a)* Tents leave different shapes on the grass when packed away.



(i) Lowri's tent leaves the shape of a rectangle on the grass.
The length of Lowri's tent is twice its width.
The width of her tent is 2·3 m.

Tom's tent leaves the shape of a square on the grass.

The perimeter of the shape, left on the grass, by each of their tents is the same.

Calculate the length of the shape left by Tom's tent. [3]

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(ii) Dewi's tent leaves a circular shape on the grass.
The radius of the shape is 1·8 m.
Calculate the area of the shape left by Dewi's tent. [2]

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(b)

CAMPING AFON



Camping Afon is due to publish a summary about people and their camping holidays in their annual report.
Five thousand *Camping Afon* customers are asked the 3 questions below.

> Camping questions
>
> 1. How old are you?
> 2. Do you own a tent?
> 3. How many camping holidays have you had this year?

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

(i) Design a data-collection sheet that could be used to collect the customers' responses.
You must plan to group the data as appropriate. [3]

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

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4.



Latest model of GF22 phone with 16GB now £250

(a) Aled is saving for a new phone, which normally costs £250 to buy.
Here is an extract from Aled's savings spreadsheet.

	A	B	C	D	E
1		Money in	Money out	Balance	Difference from £250 target
2	01/03/15	134.50	0.00	134.50	115.50
3	18/03/15	0.00	20.00	114.50	135.50
4	27/03/15	10.00	5.00	119.50	130.50
5	06/04/15	62.25	1.00	.....	.....

(i) Complete the entries for D5 and E5 in Aled's savings spreadsheet. [2]

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(ii) Which formulae could Aled use to calculate the values in D5 and E5? [3]

Formula for D5

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Formula for E5

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(b) One option for Aled is to buy the GF22 phone from H_2O.
He would pay £25 per month for 12 months.
If all 12 monthly payments are made on time, H_2O will reward him by giving him back 10% of his total payments.

Alternatively, Aled could buy the same phone from *Scoot*^{3}.
The option plan at *Scoot*^{3} requires a single payment of £100 and 10 further payments of £17.95.

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

Which of these two options should Aled consider to be the cheaper option, buying the phone from H_2O or from *Scoot*[3]?
You must

- show all your working, and
- give the condition for this being the cheaper option. [6]

(ii) Calculate the percentage increase on the original cost of the phone that a customer would pay in selecting the option plan from *Scoot*[3]. [2]

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5. A magazine has published a table to help readers understand nutrition labels.

How to read nutrition labels			
	High	**Medium***	**Low**
Total fat	if greater than 17·5 g per 100 g		if 3 g or less per 100 g
Saturated fat	if greater than 5 g per 100 g		if 1·5 g or less per 100 g
Sugars	if greater than 22·5 g per 100 g		if 5 g or less per 100 g
Salt	if greater than 1·5 g per 100 g		if 0·3 g or less per 100 g

Medium* is between the High and Low classifications.

(a) Write a description for Medium **Sugars**. [3]

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(b) Complete the table for Tortiglioni pasta by stating High, Medium or Low. [1]

Tortiglioni pasta Nutrition	per 100 g	High, Medium, or Low?
Total fat	1·5 g	.....
Saturated fat	0·3 g	.....
Salt	0·01 g	.....

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(c) Some of the details of total fat, saturated fat, sugars and salt from the label on a tin of baked beans are given in the table below.

(i) Complete the table below by inserting values correct to 1 decimal place. [3]

Baked beans	per 100 g	per (½ tin) serving
Total fat	0·4 g	..... g
Saturated fat	0·2 g	..... g
Sugars	5·7 g	11·7 g
Salt	..... g	1·85 g

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(ii) Use the information in the table above to complete the statement below. [2]



The baked beans in this tin weigh ..... *g*

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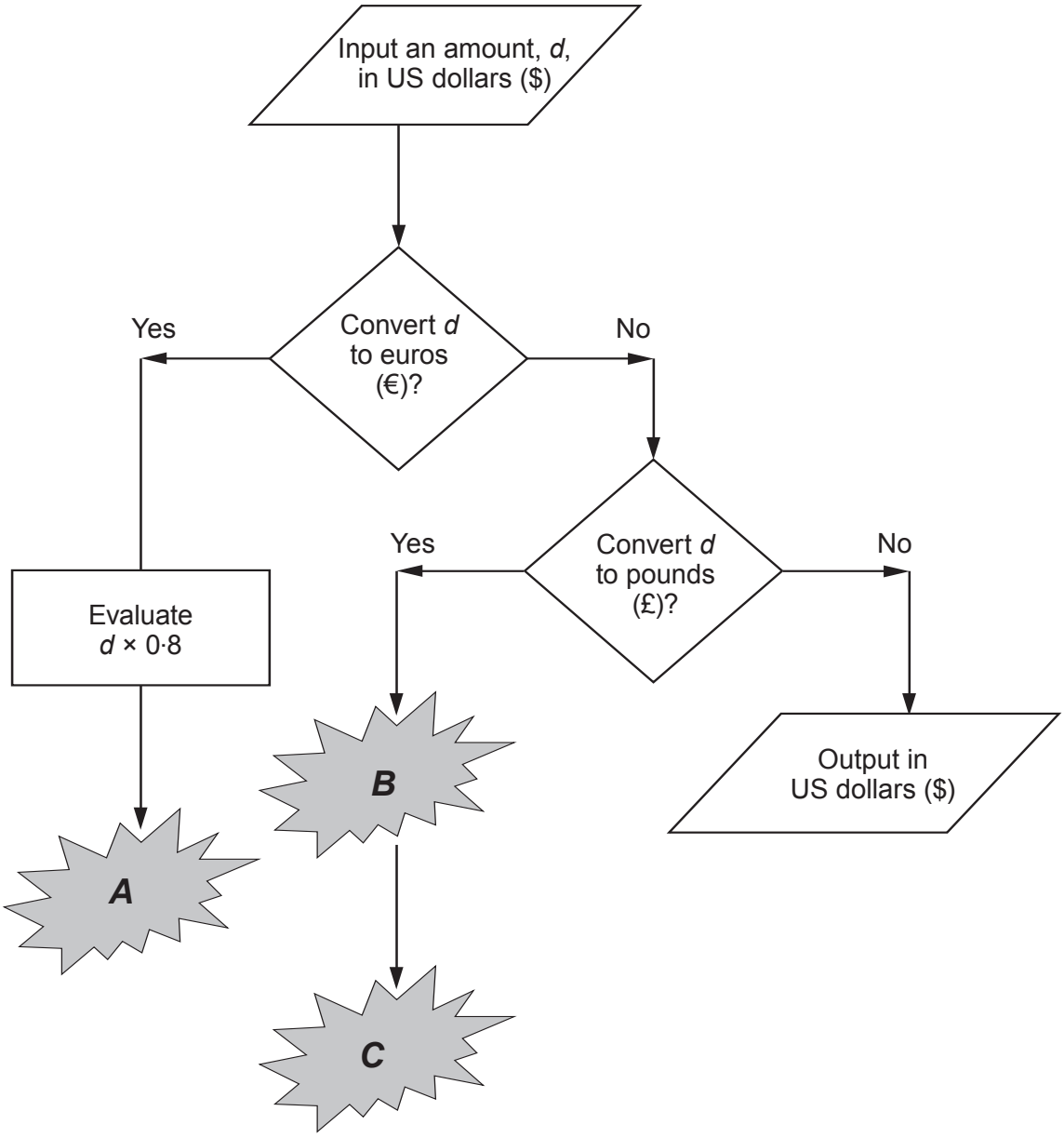
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6. The following is a section of a flowchart.



The exchange rates from US dollars ($) to pounds (£) and euros (€) are

$1 = £0.62
$1 = €0.80

(a) What would this section of a flowchart be used for? [1]

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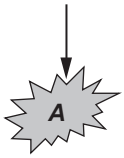
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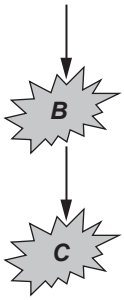
(b) There is a missing flowchart symbol indicated by



Draw the missing flowchart symbol and complete with an appropriate statement. [2]



(c) There are two missing flowchart symbols indicated by



Draw the two missing flowchart symbols and complete with appropriate statements. [3]





(d) Calculate the number of dollars that would be converted to €280. [2]

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Turn over.

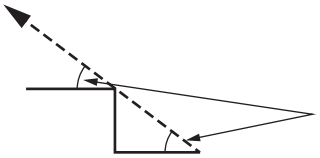
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7. Marged has a large doll's house with an irregular staircase.
The staircase has horizontal steps and vertical rises.



The angle of rise is measured from the horizontal upwards.



(a) The bottom step on a staircase is 28 mm deep with a vertical rise of 12 mm.

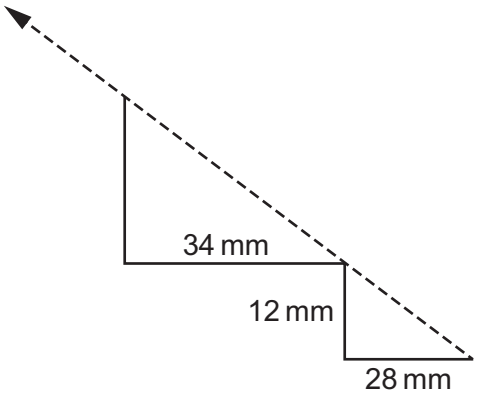


Diagram not drawn to scale

(i) **Use trigonometry** to calculate the angle of rise of the bottom step. [3]

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(ii) The second step in this staircase is 34 mm deep and has the same angle of rise.
Use trigonometry to calculate the vertical rise of the second step in millimetres. [3]

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(b) A different doll's house has a staircase with steps as shown below.
There is a different angle of rise for this staircase.

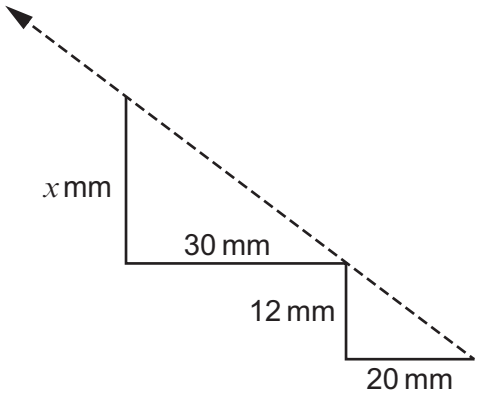


Diagram not drawn to scale

Without using trigonometry, calculate the rise x mm.
You must show your working. [2]

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Hulson Hardware sells only one type of curtain pole and curtain rings.

4 curtain poles and 35 curtain rings cost £18.06.
7 curtain poles and 88 curtain rings cost £37.49.

Calculate how much change you would get from £25 when buying 3 curtain poles and 62 curtain rings.
You must use an algebraic method. [6]

Change from £25 is .....

6

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9.

Account	Nominal interest rate	**AER** Annual Equivalent Rate, correct to 2 decimal place
Premium Saver	2·6% p.a. paid quarterly	..... %

In the table above, complete the AER column, correct to 2 decimal places, for the Premium Saver account using the following information.

AER, as a decimal, is calculated using the formula $\left(1+\frac{i}{n}\right)^n - 1$, where

- i is the nominal interest rate per annum **as a decimal**, and
- n is the number of compounding periods per annum. [4]

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10. Silk is a natural fibre.
It is produced as a result of silkworms eating mulberry leaves.



(a)

Facts

104 kg of mulberry leaves, eaten by 3000 silkworms, will produce 1 kg of silk.

This means that:

208 kg of mulberry leaves, eaten by 6000 silkworms, will produce 2 kg of silk.

Use these facts to complete the statement below by inserting values correct to 3 significant figures. [3]

..... kg of mulberry leaves are eaten by ..... silkworms to produce 7·45 kg of silk.

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(b) The typical width of a fibre of silk is 1 micrometre (μm).

1 μm = 1 millionth of a metre

Express 1 μm in metres in standard form. [2]

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(c) Production values of silk are usually compared in American dollars, US$.

World silk production in 2005		
Country	Production (in 1000 kg)	Production value (US$)
People's Republic of China	290 003	978 013
India	77 000	259 679
Uzbekistan	17 000	57 332
Brazil	11 000	37 097
Iran	6 088	20 235
Thailand	5 000	16 862
Vietnam	3 000	10 117
Democratic People's Republic of Korea	1 500	5 059

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(i) In 2005, according to the information given,
- which country's silk was the most valuable per 1000 kg, and
- which country's silk was the least valuable per 1000 kg? [3]

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2005, silk production	Country	Value per 1000 kg (US$)
Most valuable silk		
Least valuable silk		

(ii) In reality, by looking at the information given for 2005, why do you think this might not be true? [1]

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(iii) In 2005, The People's Republic of China produced 54% of the world's silk. Complete the statement below. [3]

In 2005, India produced ..... % of the world's silk.

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(iv) Does the table indicate the total world production of silk?
You must show your calculations to justify your answer. [3]

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11. In an experiment with an artificial fibre, stretch tests were carried out.
This was done by pulling at each end of a fibre and then releasing the ends.
It was found that, after stretching, the fibre did not return to its original length.

It was found that with

a stretch to x% of the original length,
the fibre returned to $(x - 8)$% of its original length,
provided $108 \leqslant x < 130$.

For example, given a stretch to 120% of the original length, the fibre returned to 112% of its original length.

(a) A fibre of length 5·4 cm is stretched to 126% of its original length.
What is the length of this fibre after releasing it from its stretch? [2]

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(b) What do you think may be the risk in the experiment if $x \geqslant 130$? [1]

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(c) Consider a fibre with an original length of 100 cm.
Use the graph paper opposite to illustrate all the possible total stretch lengths and return lengths for this fibre. [3]

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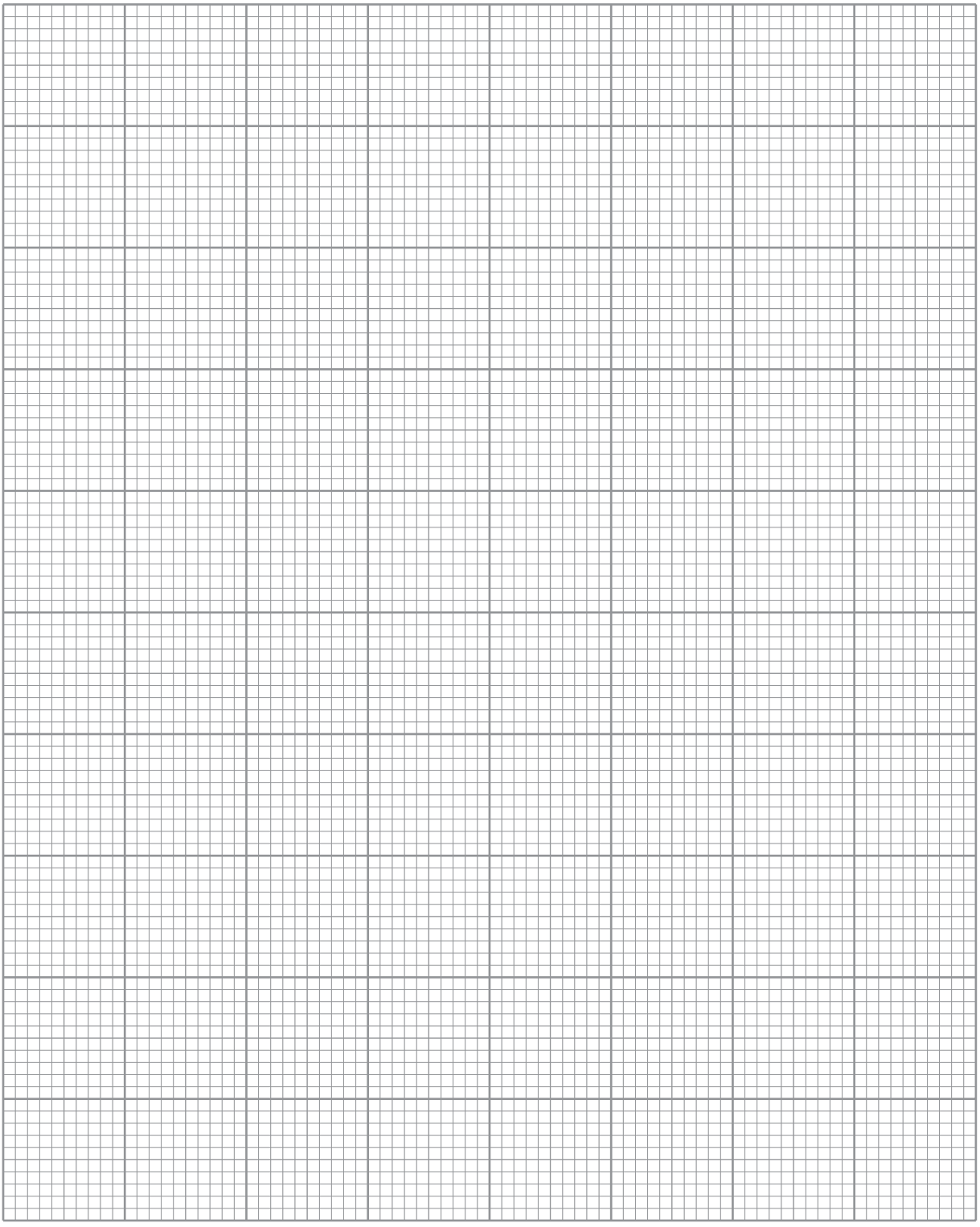
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12. A hotel is planning to buy some new desks and chairs for their conference room.
The desks cost £125 each and chairs cost £50 each.

The manager says that the hotel needs more than 100 chairs.
She has a maximum of £8000 to spend.

Let D represent the number of desks.
Let C represent the number of chairs.

(a) Write down two inequalities, in terms of D and C, that satisfy the information given by the hotel manager. [2]

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(b) Use the graph paper opposite to find a region that is satisfied by your inequalities.
You must clearly indicate your region. [3]

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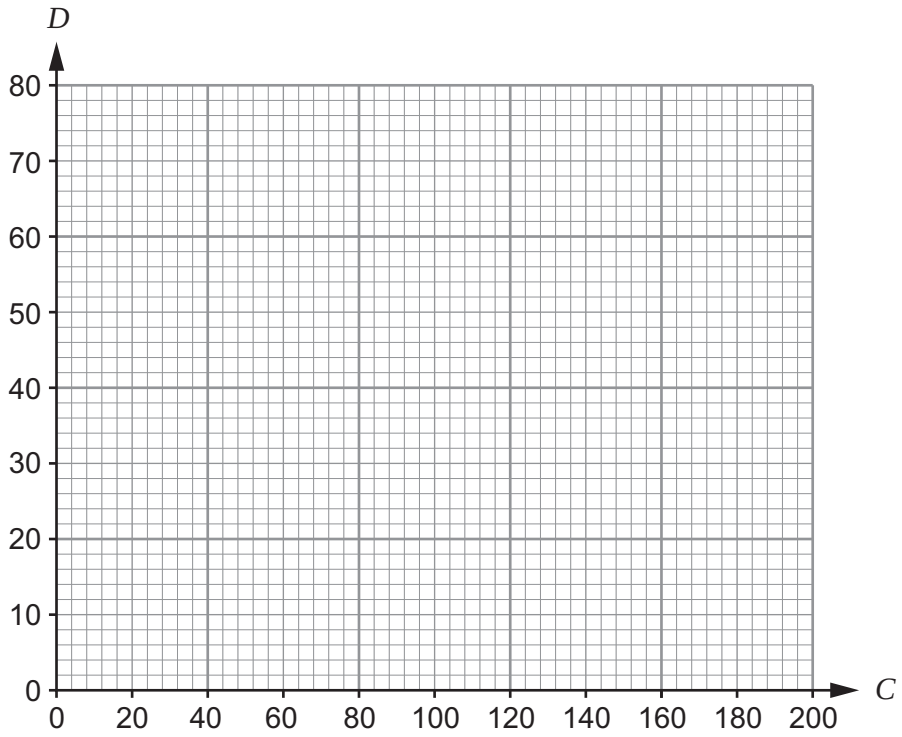
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(c) Here is a statement made by the manager.

We could buy 150 chairs and 10 desks, or we could buy 110 chairs and 15 desks.

Use your graph to complete the following table to indicate whether each part of the statement could be true or not.
You **must show on your graph** how you justify your decisions. [1]

	True or False?
We could buy 150 chairs and 10 desks.	
We could buy 110 chairs and 15 desks.	

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13.



The diagram below shows the uniform cross-section of a child's suitcase.
It is a semi-circle joined to a rectangle.

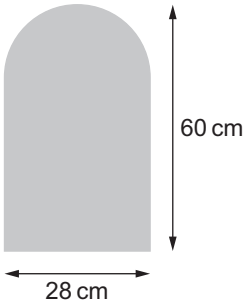


Diagram not drawn to scale

The suitcase has a depth of 10 cm.

(a) Calculate the volume of this suitcase correct to the nearest litre. [5]

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(b) A similar larger suitcase is to be made.
This one will have an overall height of 75 cm, instead of the original overall height 60 cm.
All the dimensions of the suitcase are enlarged to make the larger suitcase mathematically similar to the original suitcase.
Calculate the volume of the larger suitcase correct to the nearest litre. [3]

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GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINKED PAIR APPLICATIONS
UNIT 2 HIGHER
4362-02

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INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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APPLICATIONS OF MATHEMATICS
UNIT 2 (HIGHER TIER) SUMMER 2016

Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
1. 0.09 × 349 or equivalent (£)31.41 AND any choice of 1 D & 1 flexible lock Lock 1 AND lock 6 selected	M1 A1 A1 3	 Needs to show attempt to price 1 D and 1 flexible lock Accept 'Lock 1 and 2(nd) flexible lock' provided it is clear that 2(nd) refers to a flexible lock
2(a) 126 (m^2)	B1	
(b) Wilf's scatter graph selected with a reason, e.g. 'Wilf, the points are closer together', 'Wilf, points not spread as much', 'Wilf's graph as most points show as area increases so does the energy cost', 'Wilf's as Rowena's is more random'	E1	Do not accept 'Wilf as it has the strongest (positive) correlation' Allow 'Wilf's is a more obvious correlation', 'Wilf's is a better correlation'
(c) Straight line of best fit on Rowena's scatter diagram following the trend with some points above and below the line	B1	Do not accept a line passing through (80, 400), the line of best fit must intersect the vertical >£400 and ≤ 800 when area = 80m^2
(d)(i) Wilf's scatter diagram selected with a reason, e.g. 'Wilf's as costs are lower', 'Wilf's as no high costs', 'Wilf's because (for the same area) the heating costs (per annum) are much lower'	E1	Accept reference to 'costs fallen', 'Wilf's shows lower results (for energy bills)', 'Wilf's costs are put lower' Allow 'Wilf's as the highest costs are greater on Rowena's scatter diagram'
(ii) States or implies that headline is (possibly) not true with a reason, e.g. 'not true, larger flats save more', 'no, costs fall more for the larger flats', 'not necessarily true as the smallest flat in both have roughly the same costs'	E1 5	Do not accept 'true' unless unambiguously contradicted by the reason given Accept 'they **may be** the same' with a valid reason Accept answers based on the gradient of the line

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
3(a)(i) Lowri: perimeter (2.3+2.3+4.6+4.6 =) 13.8 (m) Tom: length 13.8÷4 3.45 (m)	B1 M1 A1	FT 'their sum of 4 measurements' ÷ 4 If no marks, award SC1 for sight of 4.6(m) or 6.9(m) *Alternative:* *(2.3 + 4.6) ÷2* *M2* *3.45 (m)* *A1*
(ii) Dewi: area $\pi \times 1.8^2$ Answer in the range 10.17 to 10.183 or 10.2 (m^2)	M1 A1	
(b)		If inequalities are used they must be correct.
Age: Use of non-overlapping groups (at least 3) and no gaps in groups for ages	B1	Need not start at 0 or 1, e.g. first group 15 – 25 etc. Do not accept e.g. 'Under 16, 17 to 25, 26 to 34, 35 or over' (because there is no 16), or '0 - 16, 17 – 25, 26 – 34, 34+' (as 34 has two options)
Tent owner: 'Yes' and 'No' options	B1	Ignore including 'other' or 'renting' or similar
Number of holidays: Use of non-overlapping groups (at least 3) and no gaps in groups given, or list of numbers to indicate (if not starting at 0, it should start at 1)	B1	
(ii) Reason, e.g. 'helps summarise', or 'smaller number of categories to manage', or 'can't list them all', or 'easier to see trends', or 'easier to read'	E1 9	Accept 'easier to compare', 'narrows the data options'

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
4(a)(i) 180.75 and 69.25	B2	B1 for either entry correct, or for the total of their 2 entries 250
(ii) (D5=) D4 + B5 – C5	B2	B1 for (D5=) D4 + B5, (D5=) D4 – C5, or (D5=) B5 – C5 or equivalent (ignoring the 3rd incorrect cell reference)
(E5=) 250 – D5 or (E5=) E4 – B5 + C5 or equivalent	B1	FT 'their D5', watch for correct operations, do not accept any missing brackets
(b)(i) H_2O payments (25×12 =) (£)300	B1	
H_2O after cash back (25×12 × 0.9 or equivalent) (£)270	B1	FT 0.9×their '25×12'
Scoot[3] (100 + 10×17.95 =) (£) 279.5(0)	B1	
Conclusion, e.g. 'H_2O cheaper if monthly payments are made on time', 'Scoot[3] cheaper than H_2O if payments are not made on time',	E1	Must FT for equivalent level decision making provided at least B1 previously awarded Do not accept 'H_2O as it is cheaper'
QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(ii) Scoot[3] % increase $\frac{279.5(0) - 250}{250}$ (× 100) or $\frac{279.5(0)}{250}$ (× 100) - 1 (× 100)	M1	FT 'their 279.5(0)' OR sight of 250 × 1.118 (= 279.50)
11.8(%)	A1	Accept 12(%) from correct working shown Do not accept 11(%)
	13	

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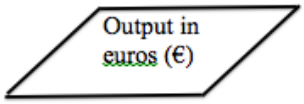
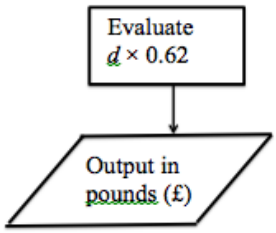
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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
5(a) (Medium if) greater than 5g and less than or equal to 22.5g (per 100g)	E3	E2 for indication of between 5g and 22.5g but one of the exclusive/inclusive bounds is not correct, e.g. 'greater than 5g and less than 22.5g', 'between 5g and 22.5g' E1 for giving description with indication of 'greater than 5g' or 'less than or equal to 22.5g', or, '5g - 22.5g' Ignore17.5g also stated for E2 and E1 only
(b) Low, Low, Low	B1	
(c)(i)	B3	All 3 entries correct to 1 decimal place B2 for any 2 entries correct to 1 decimal place, or for 3 correct entries not given to 1 d.p. (e.g. 0.82, 0.41, 0901) OR B1 for any 1 entry correct to 1 d.p. or sight of or implication of '×2.05(26…)', or equivalent
(ii) 2.05 × 100 (× 2) or 100 × (0.8 × 2) ÷ 0.4	M1	Or equivalent e.g. 100 × (0.4 × 2) ÷ 0.2, 100 × (11.7 × 2) ÷ 5.7, 100 × (1.85 × 2) ÷ 0.9, '0.4g total fat is 100g, 0.8g in ½ tin, therefore 1.6g in full tin is 400g'
410(.5…g) or 411.(…g) or 400(g)	A1 9	CAO

0.4g	**0.8** g
0.2g	**0.4** g
5.7g	11.7g
0.9g	1.85g

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
6(a) Example, 'conversion of dollars', 'exchange dollars to € (and/or £)'	E1	Accept statement converting $ to £ or converting $ to € Allow 'converting money', or converting $ to $, or 'converting to £ or €'
(b) Parallelogram symbol Statement, e.g. 'Output in euros', 'amount in €'	B1 B1	Accept 'euros' or '€' alone provided inside a parallelogram For B2: 
(c) Rectangle followed by a parallelogram	B1	
1st statement, e.g. 'Evaluate $d \times 0.62$'	B1	Allow '$(d) \times 0.62$'
2nd statement, e.g. 'Output in pounds', 'amount in £'	B1	Accept 'pounds' or '£' alone provided inside a parallelogram For B3: 
(d) $280 \div 0.8$ 350 (US$)	M1 A1 8	

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
7(a) (i) tan R = 12/28 23.2(°) or 23(.19859…°) (ii) (rise =) 34 × tan 23.19859…(°) or 34×12/28 14.6(cm) or 14.5714…(mm) (b) x/30 = 12/20 or x = 12 × 30/20 or x = 1.5 × 12 or equivalent 18 (mm)	 M1 A2 M2 A1 M1 A1 8	<u>Trigonometry must be used in (a)(i) and (ii)</u> A1 for $\tan^{-1}$ 0.42857… FT 'their derived 23.2°' M1 for tan 23.2 = r/34 Must show ratio or similar triangle working, not use of 'tan' MUST FT from working
8. 4p + 35r = 18(.)06 AND 7p + 88r= 37(.)49 Method to solve simultaneous equation, allow an error but not in the equated variable with an attempt to subtract First variable correct Method to calculate second variable Second variable correct (£25 – (3p+62r) =) (£)3.59 or 359(p)	B1 M1 A1 m1 A1 B1 6	Or equivalent FT provided at least one equation is correct and consistent place value Accept in £ or p **poles £2.59** **rings 22 pence** Accept in £ or p (An answer of £21.41 is the cost of 3p+62r) FT 'their p' and 'their r' provided M1 and m1 previously awarded and both are >0
9. Use of $n = 4$ $(1 + 0.026/4)^4 - 1$ AER 2.63(%)	B1 M1 A2 4	Accept sight of an index of 4, irrespective of the fraction denominator within the bracket Correct substitution in the formula given A1 for 0.0262546… rounded or truncated, or incorrect rounding or truncation of the AER percentage. Mark final answer (box takes priority)

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
10(a) 104×7.45 or 3000×7.45 or equivalent 775 (kg) 22400 (silkworms)	M1 A1 A1	If neither A mark awarded also award SC1 for sight of 774(.8) **and** 22350 (i.e. M1 and SC1), or M1 only for either of these answers
(b)($1\mu m = \frac{1}{1\,000\,000}$ or $1\,000\,000^{-1}$ or 0.000001 (m) 1×10^{-6} (m)	M1 A1 5	
10(c) (i) Sight of any country comparison of Production value US$÷Production in 1000kg	M1	China 3.3724.., India 3.3724.., Uzbekistan 3.3724…, Brazil 3.3724…, **Iran 3.32375…,** Thailand 3.3724, Vietnam 3.3723…, **Korea 3.3726…**
Most valuable Korea 3.37(26… US$) Least valuable Iran 3.32(375… US$)	A1 A1	
(ii) Reason, e.g. 'information was not all to the same accuracy in the table', 'some values in the table may be approximate', 'some values in the table may have been rounded'	E1	Accept 'as not all countries are shown in the table' Do not accept 'tax not included', 'shipping not included'
(iii) 1% is $\frac{290\,003}{54}$ (1000kg) or 1% is $\frac{978\,013}{54}$ (US$)	M1	(1% is 5370.42593… or 18111.3519…)
India % is $77000 \div \frac{290\,003}{54}$ or $259\,679 \div \frac{978\,013}{54}$ 14(.3…%)	m1 A1	CAO *If no marks, award SC1 for an answer of 18.765…(%) rounded or truncated (from 100 × 77000/410591)*
(iv) 100% **should be** either 537042.593… (1000kg) or 1811135.19… (US$)	M1	
Table totals **actually** 410591 (1000kg) or 1 384 394 (US$)	M1	
Conclusion, NO	A1 10	CAO. Depends on M2 previously awarded *Alternatives include:* *(China) (100 ×) 290003/410591* *M1* *= 70.6(%)* *A1* *NO (as not 54%)* *A1* *(Depends on M1, A1 previously awarded)* *OR* *410591 × 0.54 (or equivalent)* *M1* *= 221719(.14)* *A1* *NO (as not 290 003)* *A1* *(Depends on M1, A1 previously awarded)* *If no calculations, e.g.* *(Countries other than China in table) 120588* *M1* *Is less than 46% without working* *A0* *No* *A0*

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<table>
<tr><th>Applications of Mathematics
Unit 2 Higher Tier</th><th>Mark</th><th>Comments</th></tr>
<tr><td>11(a) 5.4 × 1.18 or equivalent
6.37(2 cm)

(b) Risk, e.g. ‘snaps’, ‘it may over stretch and not be able to return to the original length’

(c) Axes labelled with appropriate values for the experiment with a fibre of length 100cm considering stretches from (inclusive) 108% to (exclusive) 130%

At least 2 appropriate points plotted
All correct points joined with a straight line</td><td>M1
A1

E1

B1

M1
A1

6</td><td>
Accept 6.4(cm) from correct working

Idea that this is a limit for the stretch experiment
Allow ‘too big a stretch’, ‘won’t stretch that far’

One axis total stretched length (cm), other axis released length (cm) or similar (including for stretch length (cm) and return length (cm)). Allow axes from (0, 0)
Allow as percentage increase (rather than in cm)

Must be within the required range
Allow provided at least from 110% to 125% shown

If M0, A0 award SC1 for a graph showing stretch not full stretched length with the original

<table><tr><td>Total stretch length (cm)</td><td>108</td><td>120</td><td>130</td></tr><tr><td>Return length (cm)</td><td>100</td><td>112</td><td>122</td></tr><tr><td>Stretch length (cm) (SC1)</td><td>8</td><td>20</td><td>30</td></tr></table></td></tr>
<tr><td>12(a) C > 100
125D + 50C ≤ 8000

(b)
(Dotted) line C = 100 shown
(Solid) line 125D + 50C = 8000 shown
Region between the lines indicated

(c) Using their graph:
False
True</td><td>B1
B1

B1
B1
B1

B1

6</td><td>

FT from (a)
Allow a solid line
Allow a dotted line
FT their inequality if possible from a slip
Accept FT from either line correct but for a similar region

MUST be a FT from their graph in (b) provided at least 1 line is correct.
Must be evidence to support the answers in the table
Do not accept numerical explanations.
Accept unambiguous unlabelled plots provided the table is completed correctly</td></tr>
</table>

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Applications of Mathematics Unit 2 Higher Tier	Mark	Comments
13(a) Semi-circular ½ × π × 14^2 (×10) (=307.876… × 10)	M1	Area or volume calculation
Rectangular 28 × (60 – 14) (×10) (= 1288 × 10)	M1	Area or volume calculation
Volume ½ × π × 14^2 ×10 + 28 × (60 – 14) ×10	m1	Fully correct volume calculation that could lead to a correct answer
16 (litres)	A2	A1 for sight of 15 957 to 15 960 (cm^3) or 16 000 (cm^3) FT provided at least M1 previously awarded and the volume is dimensionally correct, e.g. full circle + rectangle considered leads to 19 (litres) for A2, or 19037(.52 litres) or 19038 for A1
(b) Enlargement length ratio ×75/60 or × 1.25 or equivalent	B1	
'Volume ×1.25^3 ' or equivalent	M1	FT their answer to (a) ×1.25^3 correctly rounded to nearest whole number of litres
(Using 16 litres, volume becomes 31.25) 31(litres)	A1	(Using 15.959 litres volume become 31(.1699…) litres) *Alternative:* *New dimensions are 12.5cm depth, 35cm width and 75 height so:* *Enlargement length ratio ×75/60 or × 1.25* *B1* *½×π×17.5^2 ×12.5`+ 35×(75 – 17.5)×12.5* *M1* *31 (litres)* *A1*
	8	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

W16-4362-02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications

HIGHER TIER

A.M. WEDNESDAY, 20 January 2016

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**8**	
3.*(a)*	**7**	
3.*(b)*	**8**	
3.*(c)(d)*	**7**	
4.	**6**	
5.	**7**	
6.*(a)*	**7**	
6.*(b)*	**6**	
7.	**11**	
8.	**10**	
9.	**11**	
10.	**5**	
Total	**100**	

4362 020001

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.

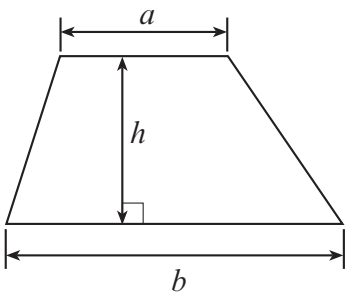
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3***(a)*.

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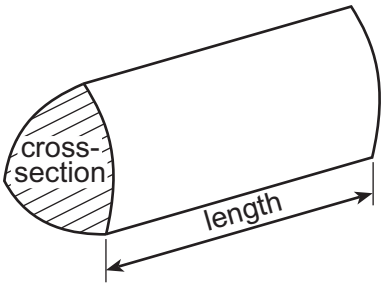
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Formula List

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

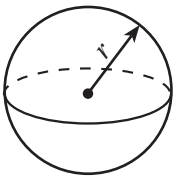


Volume of prism = area of cross-section × length



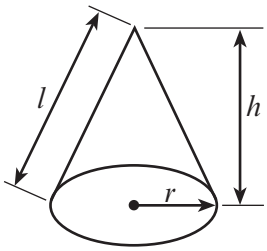
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

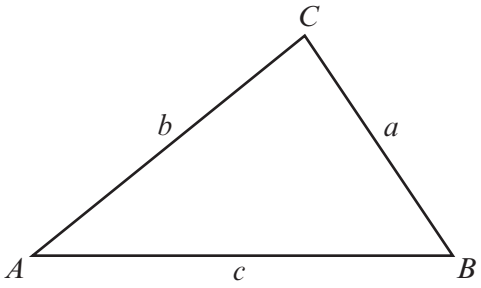


In any triangle ABC

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

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

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Examiner only

1. *(a)* Increase £760 by 26%. [2]

(b) A piece of wire is measured to be 26 cm correct to the nearest cm.
Write down the greatest and the least possible lengths of this piece of wire. [2]

Greatest length: ..... cm

Least length: ..... cm

(c) A bike was originally worth £460.
Each year, the value of the bike depreciates by 16% of its value at the start of the year.
What would be the value of the bike at the end of two years? [3]

7

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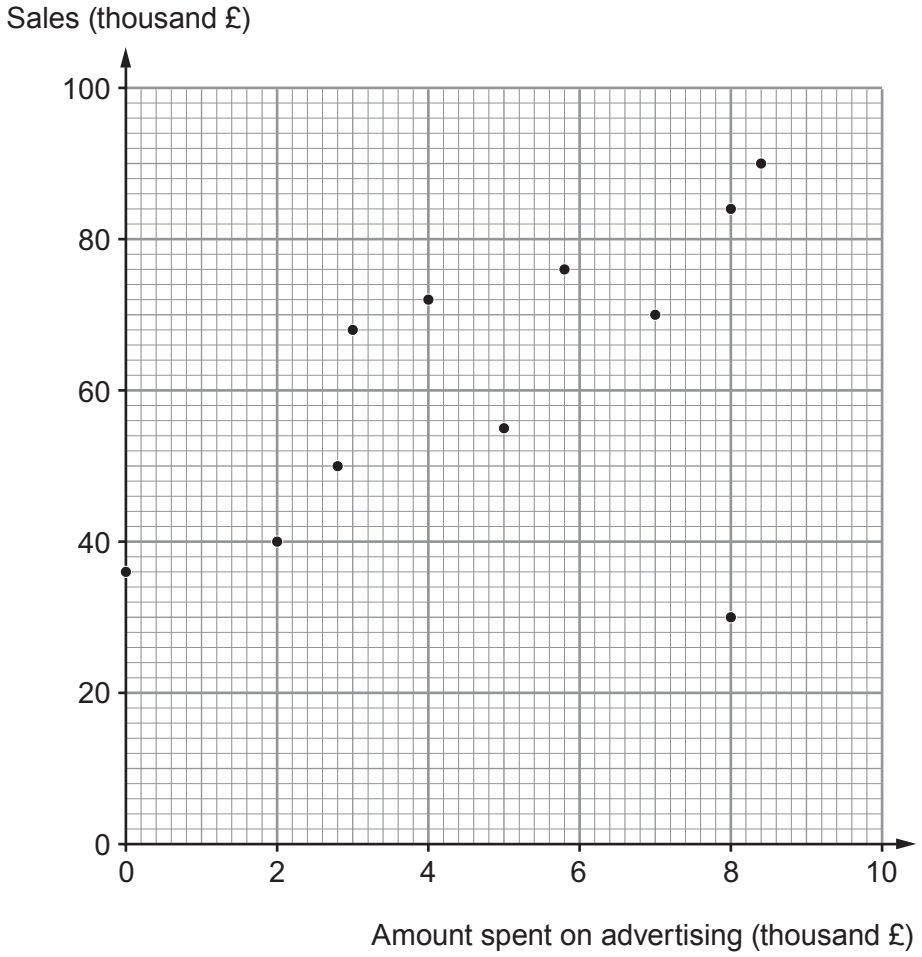
Turn over.

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2. Many shampoo companies spend money on advertising.
Rita has asked 11 companies to tell her the **amount spent on advertising (thousand £)** and the **sales (thousand £)** for their shampoo during the previous month.

She has displayed her findings in a scatter diagram, shown below.



(a) One company did not spend on advertising.
What is the sales figure for this company? [1]

.....

(b) One company was very disappointed with their sales figure, given the amount that they spent on advertising.
Which company do you think this might be?
Indicate your answer on the scatter diagram and write down the amount they spent on advertising and their sales figure. [2]

Amount spent on advertising = ...

Sales figure = ...

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(c) Ignoring the point you indicated in *(b)*, draw a line of best fit for the other points on the scatter diagram. [1]

(d) For a typical company selling shampoo, complete the following sentence.

For every £1 spent on advertising, the company expects an additional

£..... in sales of shampoo.

You **must** show your calculation. [2]

Calculation for this answer:

.....

.....

.....

.....

(e) Rita is investigating if it is worth spending money on advertising shampoo.

(i) What conclusion could she draw so far from her investigation? [1]

.....

.....

.....

.....

(ii) What should Rita do to improve her investigation? [1]

.....

.....

.....

.....

8

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3. *Island Boots* sells pairs of boots online and through mail order.



The boots are packaged in a box in the shape of a cuboid.
The dimensions of the box are 35 cm by 25 cm by 20 cm.
To stop the boots moving inside the box, *Island Boots* decides to insert a thin triangular piece of card.
This piece of card is shown by *ABC* in the diagram.

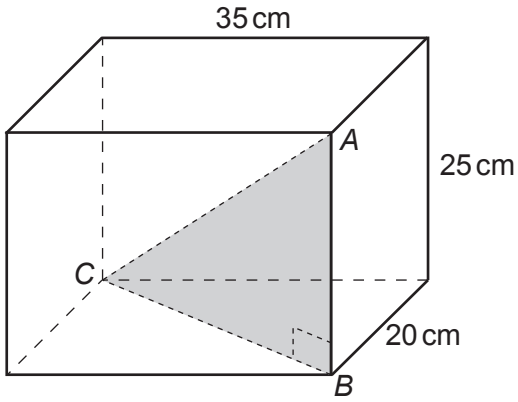


Diagram not drawn to scale

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

Calculate the length of **each side** of the triangle *ABC*.
You must show all your working. [7]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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(b) *Island Boots* keeps a spreadsheet to help track the sales of different sized boots.

A partially complete section of the spreadsheet is shown below.

	A	B	C	D	E	F	G
1			Sales				
2	Boot style	Price £	Size 5	Size 6	Size 7	Size 8	Total sales (£)
3	*Arabel*	25.00	2	3	6	4	375
4	*Carba*	42.00	0	0	8	6	...
5	*Kata*	32.50	1	...	5	6	650
6	*Yara*	18.50	...	...	6	2	407
7							Overall total sales (£)
8							.....

(i) Complete the cells **G4** and **D5**. [2]

.....

.....

(ii) The same number of size 5 *Yara* boots are sold as size 6 *Yara* boots.
Complete cells **C6** and **D6**. [3]

.....

.....

.....

.....

(iii) Write down a formula that could be used to calculate the value in **G3**. [2]

G3 = ...

(iv) Cell **G8** is to be used to total all the sales of the 4 different styles of boots.
Write down a formula for **G8**. [1]

G8 = ...

8

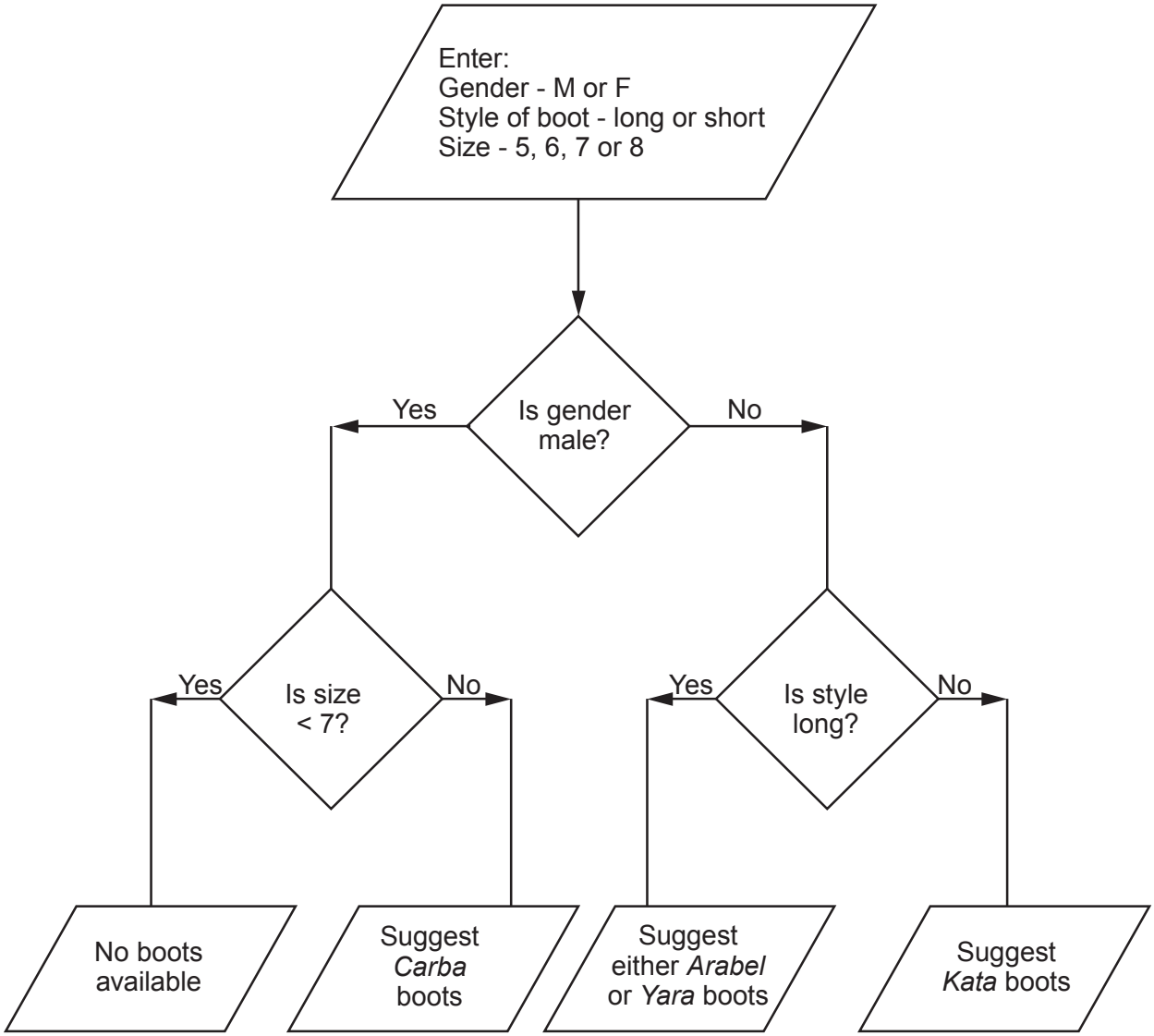
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(c) The manager has written a flowchart to help tele-sales staff give suggestions to customers on the most suitable boots to buy.



(i) Suggest suitable boots for the following customers.

Rhodri, a man who takes a size 8 in boots. [1]

.....

Clara, a young woman looking for some short boots in a size 6. [1]

.....

(ii) *Island Boots* does not sell boots suitable for some particular groups of customers. Fully describe one of these groups of customers. [1]

.....

.....

.....

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(d) Yesterday, the manager recorded the number of pairs of boots that needed to be sent to different customers in Europe and America.
The stem-and-leaf diagram shows the information.

Europe		America
	2	0 2 3
2 0	1	1 1 2 2 2
6 2 2 2 1 1 1 1 1	0	2 2 3 4 5

Key: 2 | 1 | 2 represents 12 pairs of boots
3 represents 23 pairs of boots

(i) Complete the following table. [3]

	Median	Range	Mode
Europe			
America			

(ii) The manager of *Island Boots* says:

"Looking at the average sales, I think the boots sent to America are going to shops for selling to customers, but the boots sent to Europe are for customers buying for themselves."

Do you think the manager is definitely correct?
You must give a reason for your answer. [1]

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4. Laces are made using a mix of 40% nylon and 60% polyester.
A pair of laces, of length 60 cm, weighs 8 g and costs 80p.



Another pair of the same style of laces is of length 96 cm.

(a) How much should a 96 cm pair of laces cost? [3]

(b) How many grams of **nylon** are there in a 96 cm pair of laces? [3]

6

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5. Ceri has £20 000 to invest towards her retirement.
She plans to retire in 13 years' time.

There are a number of investment accounts available, as shown in the table below.
These accounts have fixed interest rates and any money must be invested for the complete time period stated.

Investment account in	AER	Minimum investment (£)	Maximum investment (£)	Fixed term for the investment (years)
Herenow Bank	2·2%	10 000	50 000	12
Denford Building Society	2·7%	15 000	30 000	10
Dreadly Bank	3·7%	25 000	40 000	10

In which bank or building society should Ceri invest her £20 000 to make the most of her investment?
You must justify your answer by showing all calculations. [7]

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6. *(a)* The energy used to cycle can be measured as the number of calories burned.
The following table helps to work out the energy used in cycling depending on how much a person weighs.

Person weighing	130 pounds	155 pounds	180 pounds
	Cycling for 1 hour, the number of calories burned		
Mountain biking	502	598	695
Leisure cycling	236	281	327
Fixed training bike	413	493	572

The values in the table can be used to find the approximate amount of energy used by persons of different weights, and also for different time intervals.

> Remember:
> 1 kg is approximately 2·2 pounds

(i) Calculate approximately how many calories a person weighing 170 pounds will burn when mountain biking for 1 hour.
You **must** show all your calculations. [3]

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(ii) Calculate approximately how many calories a person weighing **75 kg** will burn when leisure cycling during an afternoon ride of $4\frac{1}{2}$ hours.
You **must** show all your calculations. [4]

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(b) Kate is training for a long distance cycle ride.



She splits every training session into two parts.

In all training sessions Kate cycles the first part at an average speed of x km/h.
She cycles the second part at an average speed of y km/h.

The table shows the details of Kate's training sessions.

Training session	Time for first part	Time for second part	Total distance
1	20 minutes	$\frac{1}{4}$ hour	12 km
2	$\frac{1}{2}$ hour	45 minutes	30 km

Form and solve equations, in terms of x and y, to calculate the average speeds for the first and second parts of Kate's training sessions.
Give your answer in km/h. [6]

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Average speed of first part: ..... km/h

Average speed of second part: ..... km/h

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7. *(a)* 

A pilot of an aeroplane has a fuel display on the flight deck.

This display shows the number of metric tonnes of fuel needed for a flight.

For example, 5·4 on the fuel display means a flight will require 5400 kg of fuel, which is equivalent to 4320 litres.

Complete each of the following.

Fuel display	Fuel in kg	Equivalent in litres
3·2		

[4]

Fuel display	Fuel in kg	Equivalent in litres
		5120

[2]

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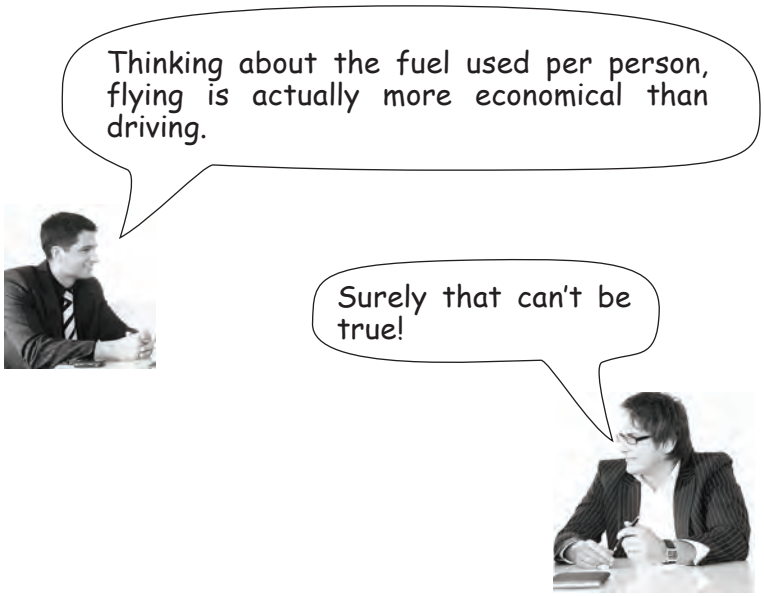
(b) In this part of the question you may assume the following for international flights.

> An aeroplane uses approximately 5 gallons of fuel per mile.
>
> Typically, an aeroplane carries about 550 passengers.

Matt travels by aeroplane, to a meeting in New York.

Matt usually drives to work and back each day on his own, a total distance of 200 miles. The typical fuel consumption of his car for this journey is 25 miles per gallon.

Matt's friend Carlo says:



(i) Is Carlo correct?
You must show all your working. [4]

(ii) Would there be occasions when Carlo may be incorrect?
You must give a reason for your answer. [1]

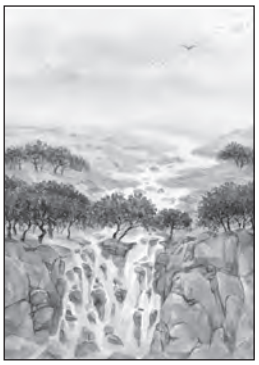
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8. Tomos is arranging an exhibition of statues and paintings.



Each statue is valued at £80 and each painting is valued at £120.

Tomos has been given the following instructions for arranging the exhibition.

- There must be at least 5 paintings on display.
- The number of paintings must be less than twice the number of statues on display.
- The value of the statues and paintings must be less than £2400.

Let x represent the number of statues on display.
Let y represent the number of paintings on display.

(a) Write down three inequalities that satisfy these instructions. [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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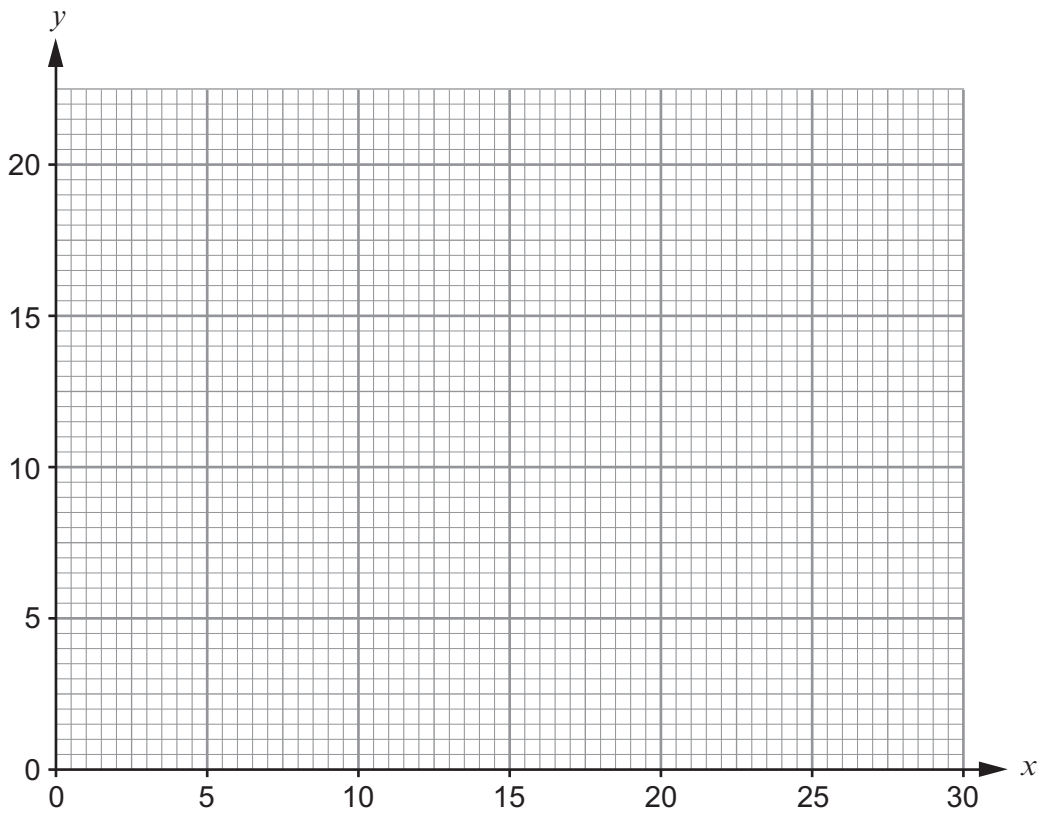
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(c) Tomos displays the maximum possible number of paintings, keeping to the instructions. Find the number of statues and paintings he displays and their total value. [2]

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Number of statues = ...

Number of paintings = ...

Total value £ .....

10

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9. Tilly grows tomatoes in greenhouses to sell at a market.



She has found that the number of ripe tomatoes, n, collected each morning is related to the number of hours of continuous sunshine on the previous day, d.
This relationship can be modelled by the following formula.

$$n = 3^d$$

(a) How many ripe tomatoes would Tilly collect on Wednesday morning if there had been 4 hours of continuous sunshine on Tuesday? [2]

(b) Tilly sells her tomatoes for £1.50 per kg.
Each of Tilly's tomatoes weighs approximately 50 g.

On Friday morning Tilly collected all the ripe tomatoes from her greenhouses to sell at the market.
She was left with 10·8 kg of her tomatoes unsold at the end of the day on Friday.

She took £51.90 from the sales of her tomatoes.

How many hours of continuous sunshine were there on Thursday?
Show all your working. [9]

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You may wish to use this graph paper in answering this question.



11

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10.





Diagram not drawn to scale

The inside of a teacup is in the shape of a hemisphere with an inside diameter of 8·4 cm.
The teacup is completely filled with sugar.
The sugar from the teacup is tipped into a cylindrical jar.
The sugar fills the jar to a height of 5·2 cm.
Calculate the diameter of the jar correct to the nearest $\frac{1}{10}$ of a centimetre. [5]

Diameter of the jar = ... cm

5

END OF PAPER

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GCSE MARKING SCHEME

JANUARY 2016

APPLICATIONS OF MATHEMATICS
UNIT 2 - HIGHER TIER
4362/02

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INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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GCSE APPLICATIONS OF MATHEMATICS
UNIT 2 - HIGHER TIER

MARK SCHEME – JANUARY 2016

Applications Unit 2 Higher Tier January 2016		Final
1(a) 760 + 0.26 × 760 or 1.26 × 760 or equivalent (£) 957.6(0)	M1 A1	
(b) Greatest 26.5 (cm) Least 25.5 (cm)	B1 B1	Accept 26.499999… Do not accept 26.49
(c) 460 – 0.16 × 460 (= 460 – 73.60 =386.4(0))	M1	OR M2 for 460 × 0.84^2 or M1 for 460 × 0.84 (=386.4)
386.4 – 0.16 × 386.4 (= 386.4 – 61.82(4) =(£)324.576) (£)324.58 or (£)324.57(.)	M1 A1	FT their 386.4, but not 460 CAO. Penalise further working -1 *Total marks to award for common errors:* *Appreciation: SC1 for 533.6(), (£)618.97(6)* *Simple depreciation: M1 for 312.8(0)*
	7	
2(a) (£)36000 or (£)36 thousand	B1	B0 for 36
(b) Advertising (£) 8 000 or (£)8 thousand AND Sales (£) 30 000 or (£)30 thousand (and indication on the scatter diagram)	B2	B1 for 8 AND 30 or appropriate indication on the diagram
(c) Line of best fit with appropriate trend shown	B1	
(d) Use of their gradient of the line of best fit Gradient answer in the range (£)5 to (£)8	M1 A1	When indication on the diagram or working seen, allow SC1 for an answer derived from use of ratio or proportion sales : advertising for any point (other than company (b)) or a point on the line of best fit, or sales £1000s / advertising £1000s
(e) (i) Conclusion, e.g. 'yes selling more the more money spent', 'don't know as only 11 companies asked', 'yes, as there is positive correlation'	E1	Allow 'a product may not be successful if not advertised'
(ii) Next step, e.g. 'gather more data', 'ask more companies'	E1	Do not accept 'ask more people' as this is about shampoo companies, so this standard answer to data questions is insufficient unless accompanied by further relevant detail
	8	

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Applications Unit 2 Higher Tier January 2016		Final
3(a) $BC^2 = 20^2 + 35^2$ $BC^2 = 1625$ or $BC = \sqrt{1625}$ $AC^2 = 25^2 + BC^2$ $AC^2 = 2250$ or $AC = \sqrt{2250}$ (Lengths are) (BC=) 40(.3cm), (AC=) 47(.4cm) (and AB= 25cm) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps. **AND** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps. **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 A1 QWC 2 7	FT 'their BC' for M1 only M1 and m1 may be combined FT their derived BC CAO. Accept given in surd form QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
3(b)(i) G4 588 D5 8 (ii) 407 ÷ 18.5(0) (= 22) (22 – 6 – 2)÷2 7 (iii) (G3 =) B3 * (C3 + D3 + E3 + F3) or equivalent (iv) (G8 =) G3 + G4 + G5 + G6 or equivalent	B1 B1 M1 m1 A1 B2 B1 8	FT 'their 22' if M1 awarded CAO *Alternative:* *407 - 8 × 18.5(0) (=407 – 148 = 259) M1* *(259 ÷ 18.5(0)) ÷ 2 (=14÷2) m1* *FT 'their 259' if M1 awarded* *7 CAO A1* B1 for 25 * (C3 + D3 + E3 + F3) or for B3 * C3 + D3 + E3 + F3 or for an appropriate expression with 1 error FT their G3
3(c)(i) Carba (boots) Kata (boots) (ii) Male with size <7 or equivalent 3(d)(i) (ii) Statement, e.g. 'no, it may seem that way because each customer in America buys a lot of boots', 'could be, but it's only based on one day', 'no, as both America and Europe have orders as single digits (as well as in the 10s), 'no, as Americans just buy more boots',	B1 B1 E1 B3 E1 7	Accept, 'anyone wanting a size 9 or above', or 'anyone wanting a size 4 or below' or 'males are not offered a long or short style of boot' Do not accept examples, e.g. 'male size 5' B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries Allow 'yes (it seems that way) as many customers in Europe buy 1 pair whilst someone in America bought 23 pairs' – there must be a Europe / America comparison. Allow 'yes (it seems that way), as the average for America is much higher' WITH either a reasonable attempt to calculate both means OR with reference to the medians

	Median	Range	Mode
Europe	2	11	1
America	11	21	12

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Applications Unit 2 Higher Tier January 2016		Final
4(a) 60:96 considered, e.g. sight of 96/60 or 1.6 80 × 96 ÷ 60 or equivalent 128(p) or (£)1.28	M1 m1 A1	*OR (60cm is 80p,1cm is) 80/60 (=1.3(33…p)* *OR 96cm costs 80 + 36×80÷60* CAO If units are given they must be correct
(b) (96cm laces weigh 8 × 1.6 or 8 × 96/60 =) 12.8 (g) 0.4(0) × 12.8 5.12 (g of nylon)	B1 M1 A1 6	FT their '×1.6', FT their derived 12.8g CAO *If no marks, SC1 for (0.4×8 =) 3.2(g)*
5. Herenow Bank 20000 × 1.022^{12} (£) 25 968.13 Denford Building Society 20000 × 1.027^{10} (£) 26 105.645.. Conclusion, e.g. 'Denford, with still 2 further years to invest somewhere', 'Denford is more (with time to make more interest too)'	 M2 A1 M2 A1 E1 7	*Penalise working with Dreadly Bank -1, unless rejected* M1 for sight of 1.022^{12} or for 20000×1.022 M1 for sight of 1.027^{10} or for 20000×1.027 FT provided at least M2 awarded Ignore an incorrect statement provided a valid reason is given *Alternative: comparison of 1.022^{12} = 1.298% and 1.027^{10} = 1.305% is awarded B4, then E1 for conclusion "Denford, as more interest in less time' or similar*
6(a)(i) Strategy, **use of** suitable linear type relationship, e.g. Mountain biking burns 502÷130 or 598÷155 or 695÷180 (=3.86 calories/pound), OR Review of differences or gaps 180 – 155 = 25 pounds AND 695 – 598 = 97 calories Method of estimating, e.g. 170 × 3.86 calories/pound OR 97 ×15/25 + 598 Accept answers in the inclusive range 653 to 663 (ii) Weighs (75 × 2.2 =) 165 pounds Suitable method to estimate, e.g. weight × 1.8(1.. calories/ pound per h) (× 4½) OR 281 + 10/25×(327 – 281) (×4½) ×4½ From suitable calculations, answers in the inclusive range 1336 to 1350 (calories)	S1 M1 A1 B1 M1 m1 A1 7	Quotients need to be appropriate for use, not inverted Accept equivalent methods, e.g. setting up linear equations or unitary ratios Example: 695 ×170/180 (=0.944…) is S1, M1 Only accept answers in this range FT 'their 165 pounds' Accept equivalent methods with linear equations or unitary ratios Accept as complete method for 1 hour. Allow use of weight as '75' for M1 only Allow FT answers from similar premature approximation
6(b) Set up any one suitable equation, e.g. ⅓ x + ¼ y = 12 OR ½ x + ¾ y = 30 Two suitable equations with consistent units of time, e.g. ⅓ x + ¼ y = 12 AND ½ x + ¾ y = 30, OR 20x + 30y = 720 AND 30x + 45y = 1800 Full method to solve, e.g. equate coefficients and decision to subtract First variable correct Method to calculate second variable Second variable correct	S1 B1 M1 A1 m1 A1 6	Allow with mixed units of time, e.g. 20 x + ¼ y = 12 OR ½ x + 45y = 30 Allow 20x + 15y = 12 AND 30x + 45y = 30 FT provided at least one equation is correct (in hours or minutes consistently) and equivalent difficulty Allow 1 error in a value other than the equal coefficient Penalise once only as km/min* (Penalise once only as km/min*) **Penalise once only for answers given as km/min,* *x = 0.2 (km/min), y = 0.533… (km/min)* **x = 12 (km/h), y = 32 (km/h)**

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Applications Unit 2 Higher Tier January 2016		Final
7(a) Working towards unitary ratio, e.g. 1000kg is equivalent to 4320÷5.4 (=800 litres), or 1kg is equivalent to 4320÷5400 (=0.8 litres)	M1	Place value may be incorrect Allow inverted quotients, but must be used correctly for m marks
3.2 is 3200kg AND 3200 ×4320÷5400 or 5120 ÷ 0.8 or equivalent	m2	Full method that could lead to a correct answer m1 for digits of calculations correct with place value error m1 or m2 also implies initial M1
3200(kg) AND 2560 (litres)	A1	
Use of 5120 = 2×2560 OR 5120×5400÷4320 OR equivalent	M1	FT 'their 2560'
6.4 AND 6400(kg)	A1	
(b)(i) <u>Plane 5 gallons of fuel per mile</u> (1 gallon =) 1 ÷5 (miles per gallon) ×550 (person miles per gallon) Plane: total distance travelled = 110 (person miles per gallon)	 M1 M1 A1	*Alternative reverse calculations:* *Car (per person) 25 mpg is equivalent to* *1 mile using (1/25=) 0.04 (gallons) M1* *Plane (per person) 1 mile uses 5/550 M1* *= 0.00909.. (gallons per person) A1* *(accept 0.01 from correct working)*
Implies Carlo is correct by appropriate comparison, e.g. 'Yes, as per person, car is 25mpg, plane is 110 mpg	A1	*OR e.g. 'Yes, as per person per mile, car is 0.04 gallons but plane is (only) 0.009090… gallons A1* *Alternative:* *(200 miles with 8 gallons in car)* *200 miles is 1000 gallons in plane M1* *1000÷550 M1* *= 1.8(1.. gallons per person by air) A1* *Implies Carlo is correct by comparison 8 to 1.8(1..) gallons per person A1* *Alternative:* *(200 miles with 8 gallons in car)* *200 miles is 1000 gallons in plane M1* *550 people by car would be 8 × 550 M1* *= 4400 (gallons) A1* *Implies Carlo is correct by comparing 550 people, 1000 to 4400 gallons A1*
(b)(ii) Suitable explanation, e.g. 'not true if the plane isn't filled', 'could be a big difference between aviation and car fuel prices', 'car travel economy improves when more than one person'	E1	Accept reference to more expensive cost for domestic, or short haul flights.
	11	

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Applications Unit 2 Higher Tier January 2016		Final
8(a) $y \geq 5$ AND $y < 2x$ AND $80x + 120y < 2400$	B4	B3 for any 2 correct inequalities B2 for any 1 correct inequality with at least one other inequality only inaccurate due to incorrect symbol (>, ≥, <, ≤) B1 for any 1 correct inequality, **or** B1 for at least two inequalities only inaccurate due to incorrect symbol (>, ≥, <, ≤)
(b) Line y = 5 drawn correctly	B1	FT their inequalities if possible
Line y= 2x drawn correctly	B1	
Line 80x + 120y = 2400 drawn correctly	B1	
The correct region indicated	B1	CAO
(c) 8 statues and 14 paintings (8×80 + 14×120 = 640 + 1680)	B1	FT their graph provided at least B2 in (b) Independent of their graph, may be from calculation. Allow correct response from incorrect graph
(£)2320	B1	Allow 2320 alone, without the number of paintings and statues i.e. B0, B1 *Allow SC1 for 9 statues with 14 paintings* ***and*** *£2400 cost OR* *Allow SC1 for 7 statues with 14 paintings* ***and*** *£2240 cost*
	10	
9(a) (n =) 3^4	M1	
81 (tomatoes)	A1	
(b) 10.8 kg is (10.8×1000÷50 =) 216 tomatoes left	B1	
Number of kg tomatoes sold (£)51.90 ÷ (£)1.50 (=34.6 kg)	M1	
Number of tomatoes sold ×1000 ÷ 50	m1	
692 (tomatoes)	A1	
Total number of tomatoes (216+692=) 908	B1	FT their 692 provided at least M1 awarded *Alternative:* *Mass of tomatoes sold 51.90÷1.50 (=34.6kg) M1* *Total mass of tomatoes taken to market* *34.6 + 10.8 or 51.90÷1.50 +10.8 m1* *= 45.4 kg A1* *Number of tomatoes taken to market* *45.4 ×1000 ÷ 50 0R 45.4 × 0.05 M1* *= 908 A1*
$908 = 3^d$	B1	FT their 908, provided at least 3 marks previously awarded
Method to solve, e.g. trial & improvement or attempt the graph of $n = 3^d$	M1	
Appropriate graph plotted between d = 6 and d = 7, or trial for d = 6 and d = 7 (729 and 2187)	m1	
6.2 (hours of continuous sunshine)	A1	
	11	
10. Volume of cup = $2\times\pi\times4.2^3\div3$ or equivalent	M1	Do not accept with sight of 'r=8.4'
155 (cm^3) or 49.392π (cm^3)	A1	Values rounding to 155, e.g. 155.1.. or 155.2… Award this A1 as implied by correct sight of equating volumes with intention to cancel π
Volume jar 155 = $\pi\times r^2\times5.2$ or 49.392π = $\pi\times r^2\times5.2$	M1	FT their volume equated to $\pi\times r^2\times5.2$
$r^2 = 9.498\ldots$ or r = 3.08…	A1	
Diameter of the jar 6.2 (cm)	A1	CAO. Must be 1dp
	5	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

S15-4362-02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications
HIGHER TIER

P.M. THURSDAY, 11 June 2015

2 hours

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

4362
020001

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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.

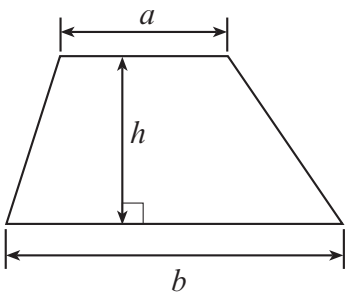
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

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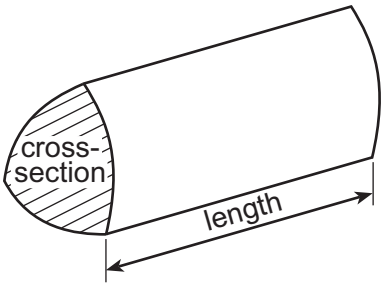
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Formula List

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

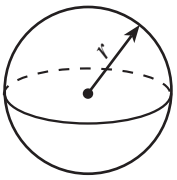


Volume of prism = area of cross-section × length



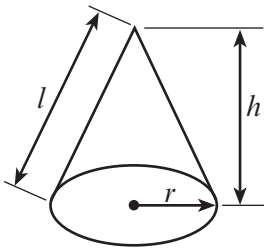
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

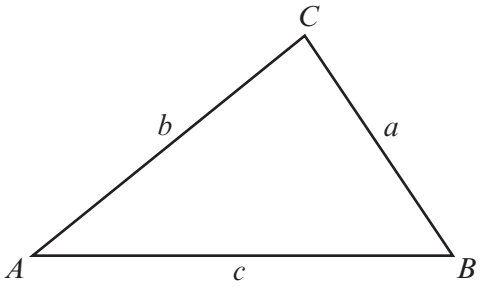


In any triangle ABC

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

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

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1. Lois lives in Llandudno.
She is changing some pounds into other currencies before going on holiday in Europe.

The exchange rates are displayed below.

Exchange £1 for	
1.48 SF	Swiss francs
1.20 €	euros
5.04 Zl	Polish zloty

(a) Calculate how much Lois would receive in exchanging each of the following.

(i) £450 exchanged for Swiss francs. [2]

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..... Swiss francs

(ii) £300 exchanged for Polish zloty. [2]

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..... Polish zloty

(b) How many pounds will Lois have to exchange to receive 363.60 euros? [2]

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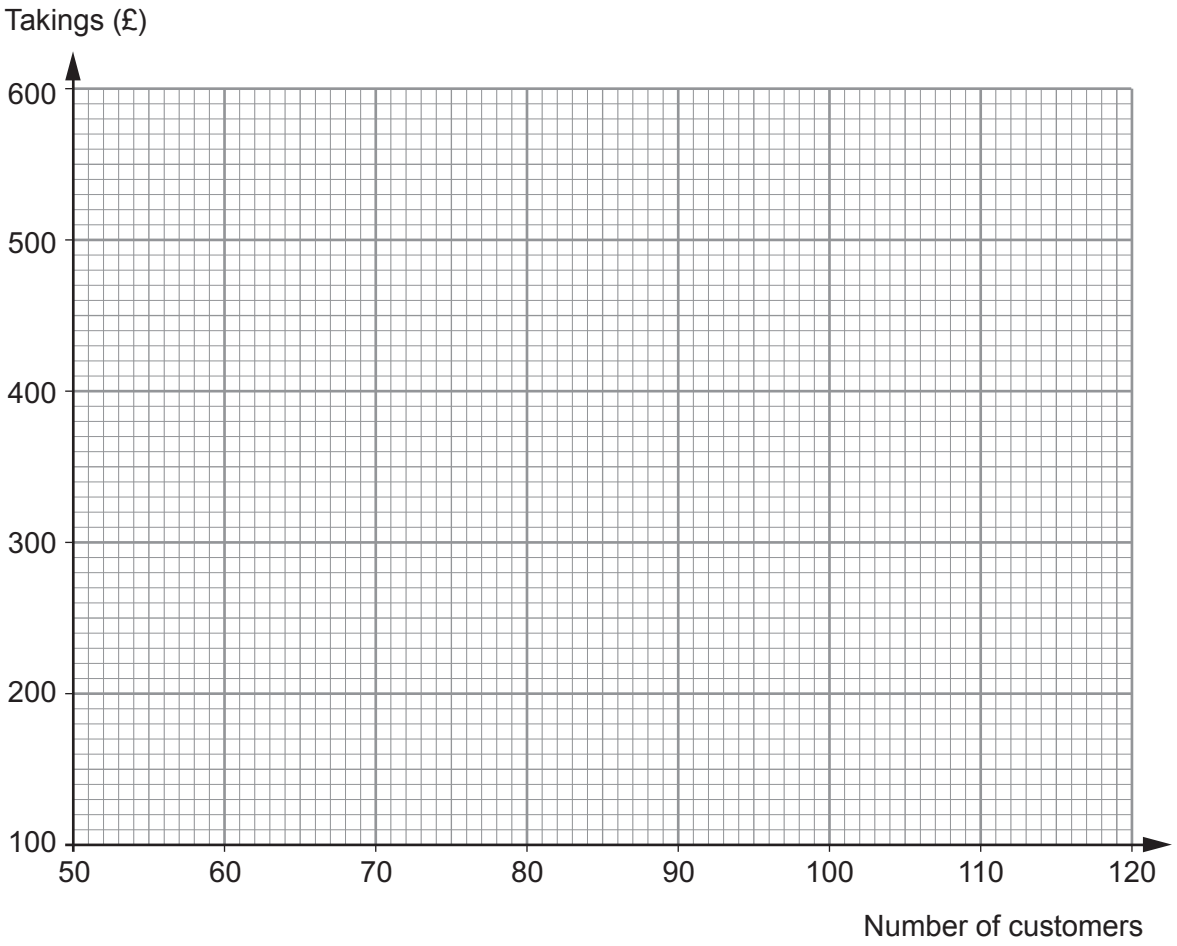
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2. Every Monday for 6 weeks, the number of customers entering a juice bar and the takings of the juice bar were recorded.
The takings were recorded correct to the nearest £10.

The table below shows the results.

Number of customers	104	82	120	64	70	118
Takings (£)	480	390	560	290	310	530

(a) On the graph paper below, draw a scatter diagram of these results. [2]



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

(c) Estimate the takings for a Monday when there are 95 customers. [1]

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(d) Approximately how much does a customer spend, on average, in the juice bar on a Monday? [2]

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3. *You will be assessed on the quality of your written communication in this question.*



Jenna is saving for a summer holiday.
She has already saved £45.

Jenna earns £250 per week.
She plans to save 12% of the money she earns each week towards her holiday.

She has to pay a £100 deposit for the holiday in 2 weeks' time.
12 weeks after paying her deposit, Jenna has to make a final payment of £365.

Show whether it is possible for Jenna to save enough to pay the deposit on time and make the final payment on time.
You must show all your working. [6]

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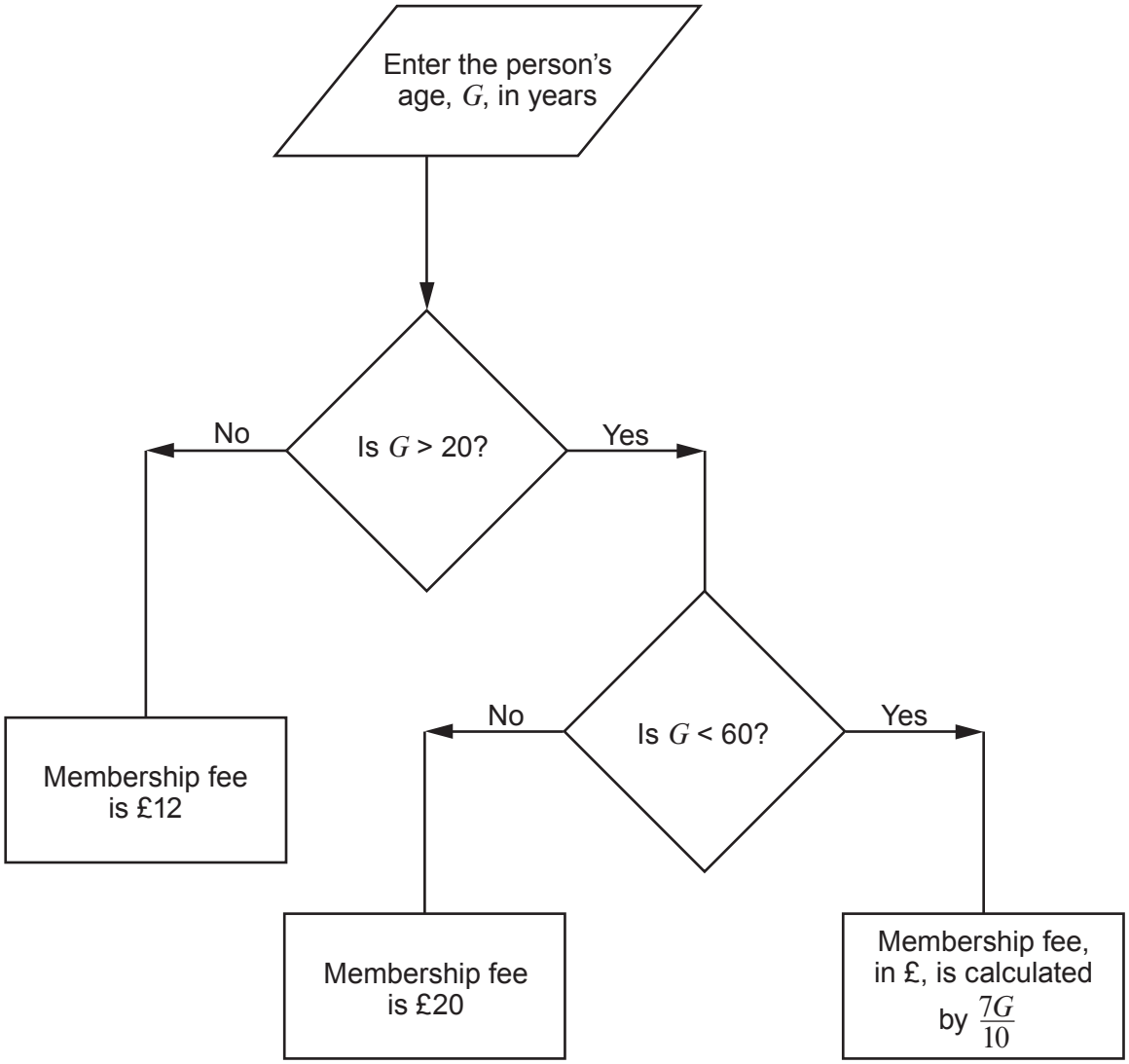
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4.



The following section of a flowchart is used to find the membership fee for a snooker club.



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(a) Use this section of the flowchart to find the membership fee for each of the following people.

Donald, aged 20 [1]

.....

Dawn, aged 16 [1]

.....

Shiona, aged 52 [2]

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(b) Shiona, aged 52, has a younger brother Marc, aged 42.
How much **less** does Marc have to pay to be a member of the snooker club than his sister Shiona? [2]

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(c) At what age does the membership fee become more expensive than the membership fee for a 60 year-old?
You must show your working. [2]

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5. A retail index number is calculated by looking at increases or decreases in price over a period of time.
A loaf of bread that cost £1.60 on 1st January last year, costs £2.00 on 1st January this year.



The index number for this year's cost of a loaf of bread, based on last year's cost, is calculated as follows:

$$\text{Index number} = \frac{2.00}{1.60} \times 100$$

$$= 125$$

(a) The index number for this year's cost of bananas, based on last year's cost, is 140.



(i) Has the cost of bananas increased more or less steeply than the cost of a loaf of bread?
You must give a reason for your answer. [1]

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(ii) For this year's costs, are you able to tell from the information given whether 1 kg of bananas is cheaper or more expensive than a loaf of bread?
You must give a reason for your answer. [1]

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(b) Below is last year's cost of a basket of shopping.
The index number for calculating this year's cost, based on last year's cost, is also given.



Item	Cost last year	Index number for calculating this year's cost based on last year's cost
Box of teabags	£2.36	110
Box of eggs	£2.40	105
Carton of milk	90p	120
Carton of orange juice	£1.10	90

Calculate the total cost of this basket of shopping for this year.
Give your final answer correct to the nearest 10 pence. [4]

(c) A litre tub of ice cream now costs £2.36.
The index number for the cost of a litre tub of ice cream based on last year's cost is 97.
What was the cost of a litre tub of ice cream last year? [3]

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6. Gareth spends some time looking at his outgoings and his savings.

(a) Gareth is trying to estimate the total cost of the electricity he uses over a 90-day period.

Last year he used 550 units of electricity during a 90-day period.
The cost of electricity was 16p per unit.
The standing charge was 30p per day.
VAT was charged at 5%.

For a similar 90-day period this year Gareth estimates that

- he will use the same quantity of electricity,
- the cost of electricity per unit will rise by 12%,
- the standing charge will rise by 8%,
- VAT will be charged at 5%.

His sister has said that this will mean a 9% rise in the total cost of his electricity.

By calculating the actual increase in the total cost that Gareth is estimating for this 90-day period, find out whether Gareth's sister has made a reasonable statement.
You must show all your working. [8]

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(b) Gareth decides to invest £3000 in a savings bond offering a fixed rate of 1·25% per annum.
The investment company provides information stating how much the bond will be worth after 5, 15 and 25 years.
Gareth has lost the details so he decides to create his own table.

Complete Gareth's table below, giving your answers correct to the nearest penny. [3]

	After 5 years	After 15 years	After 25 years
£3000 bond is worth	£.....	£.....	£.....

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7. *(a)* Ursula is designing data collection sheets.

She needs to decide on suitable groups for collecting her data.

The data she is collecting is as follows:

- European shoe sizes, with none smaller than 32 and none greater than 46.
- Lengths of shoe laces, with no measurement less than 30 cm and no measurement greater than 88 cm.

For each data collection sheet, Ursula has decided she must have **at least 5 groups all of equal width**.

The outlines of Ursula's data collection sheets are given below.
Complete the first columns of these data collection sheets to show suitable groups. [4]

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European shoe size	Tally	Frequency

Length of shoe lace (cm)	Tally	Frequency

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(b) Luc has been recording 'hours of sunshine' each day.

The table below shows Luc's data collection so far.

Hours of sunshine		Frequency
None		
Less than an hour		
More than an hour	✓ ✓	
More than 2 hours	✓ ✓	
More than 3 hours	✓	

(i) Griff looks at Luc's table and says:

"Looks to me like Luc has been recording hours of sunshine for **five** days."

Explain why Griff could be correct. [1]

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(ii) Sara looks at Luc's table and says:

"Looks to me like Luc has been recording hours of sunshine for just **two** days."

Explain why Sara could be correct. [1]

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8. *(a)* An organic fruit farm sells cherries and raspberries.





Poppy buys 3 kg of cherries and 5 kg of raspberries.
Harry buys 4 kg of cherries and 7 kg of raspberries.
Poppy spends £66.10 and Harry spends £91.

Use an algebraic method to calculate the **total cost** of 10 kg of cherries and 1 kg of raspberries.
You must show your working. [6]

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(b) The organic fruit farm also sells gooseberries and blackcurrants.
Gooseberries sell for £8.20 per kg.
Blackcurrants sell for £10.80 per kg.
An incomplete section of the spreadsheet used to enter sales of fruit is given below.

	A	B	C	D	E	F	G
1							
2	Prices	Cherries	.....				
3		Raspberries	.....				
4		Gooseberries	8.20				
5		Blackcurrants	10.80				
6							
7	Customer	Cherries	Raspberries	Gooseberries	Blackcurrants	Spend	Total
8	Poppy	3	5	0	0	66.10	66.10
9	Harry	4	7	0	0	91.00	157.10
10	Gemma	0	0	3	2	....	....
11	Nia	0	0	5	3	....	....
12	Haf	....	....	....	....	....	....

(i) What amounts should be entered in cells C2 and C3? [1]

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(ii) Why do you think the spreadsheet is designed so that amounts can be entered in cells C2, C3, C4 and C5? [1]

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(iii) Complete the value of each entry for F10, G10, F11 and G11 in the spreadsheet above. [2]

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(iv) Haf intends to buy some of all 4 types of fruit.
Write down the formulae that would be used to calculate the amounts for cells F12 and G12.

F12 [2]

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G12 [1]

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9. Ben and Catrin both buy new fleece jackets.





The label inside Ben's jacket says:

Astra Jacket
90% Polyester, 10% Elastane
Soft fleece fabric 180 g/m^2

The label inside Catrin's jacket says:

Snug Jacket
80% Polyester, 20% Elastane
Stretchy fleece fabric 140 g/m^2

Ben and Catrin know the following facts about their jackets.

- Ben's jacket weighs 234 g.
- Catrin's jacket is made with 8% less fleece fabric than Ben's jacket.

(a) How much does Catrin's *Snug Jacket* weigh?
You must show your working. [4]

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(b) The density of the fleece fabric in *Snug Jackets* is actually 140 g/m^2, correct to the nearest 2 g/m^2.
This fabric is sold to the makers of the jackets on cardboard rolls.
A cardboard roll with fleece fabric on it weighs 4·5 kg.
The empty cardboard roll weighs 360 g.



Complete the following sentence by inserting a correct value, accurate to 4 significant figures.

The roll contains **at least** ..... m^2 of *Snug Jacket* fleece fabric.

You must show your working. [6]

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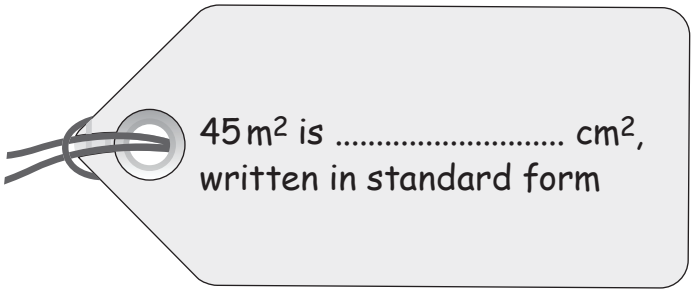
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(c) A different roll contains 45 m^2 of fleece fabric.
This roll of fleece fabric has a label attached giving the area of fabric in cm^2, written in standard form.
Complete the label below.
You must show your working. [2]

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10. A garden centre sells plastic plant pots and saucers.



Plant pots cost £0.45 each.



Saucers cost £0.20 each.

The garden centre manager says that last week

- the total number of plant pots and saucers sold was less than 3500 **and**
- more than £500 was taken from sales of plant pots and saucers.

Let P represent the number of plant pots sold.
Let S represent the number of saucers sold.

(a) Write down **two inequalities**, in terms of P and S, that satisfy the information given by the garden centre manager. [2]

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(b) Use the graph paper opposite to find a region that is satisfied by your inequalities. You must clearly indicate your region. [3]

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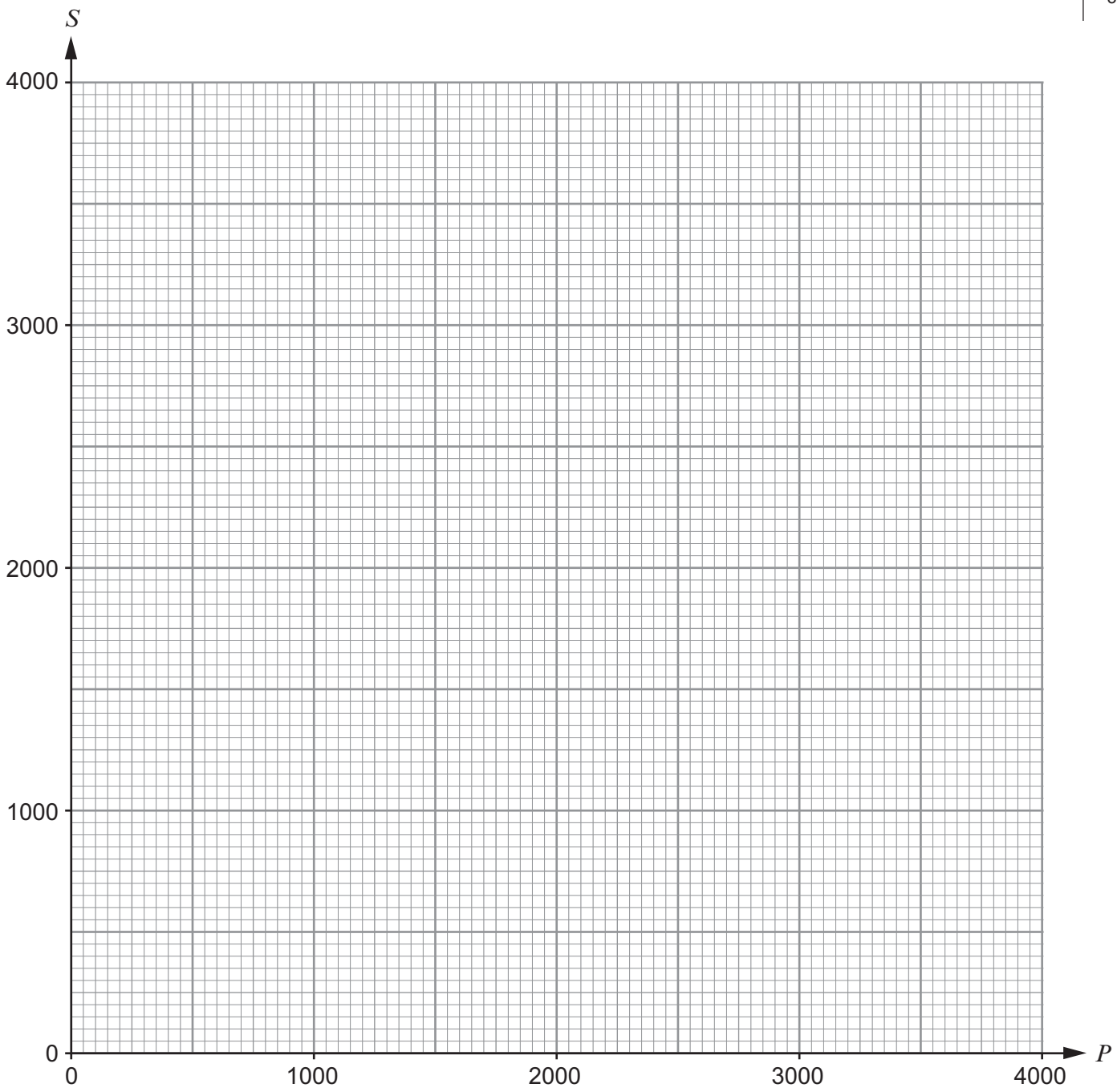
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(c) The following statement was made by a sales assistant about the sales of plant pots and saucers last week.

"800 plant pots and 1500 saucers were sold."

Use your graph to complete the following table to indicate whether the statement could be true or not.
You **must show on your graph** how you justify your decision. [1]

Statement	Could be true? Yes or No
800 plant pots and 1500 saucers were sold	.....

6

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11. *BuildGen* makes roof turrets for apartment blocks.





(a) *BuildGen* is building a turret in the shape of a square-base pyramid.
The frame for the turret is made using metal rods.
An outline of the frame is shown below.

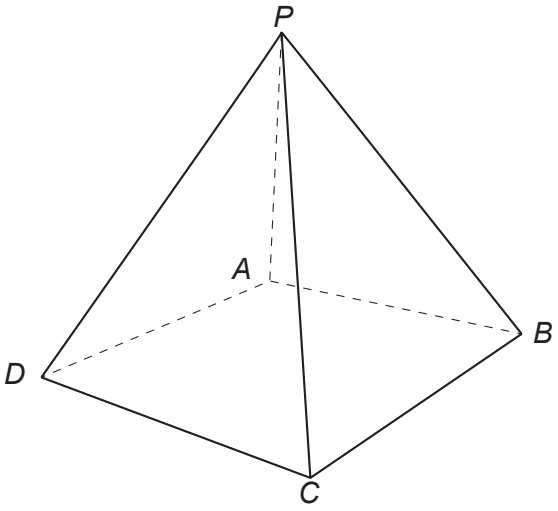


Diagram not drawn to scale

(i) *BuildGen* has ordered two packs of metal rods. Each pack contains 4 metal rods.
One pack contains rods of length 6 m and the other pack contains rods of length 10 m.
No rods are cut.
Calculate the angle between the diagonal *BD* and the rod *DP*. [6]

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(ii) The four slanting faces of the turret are to be tiled.
Calculate the total area to be covered in tiles. [4]

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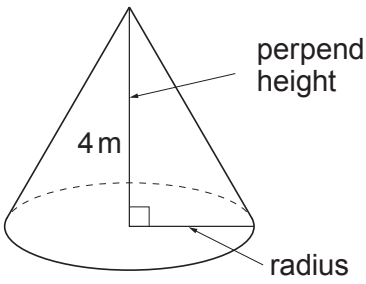
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(b) *BuildGen* also builds turrets in the shape of a cone.



This turret has a perpendicular height of 4 m.



The volume of the turret is 122 m^3.
Calculate the radius of this turret. [3]

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(c) *BuildGen* makes similar-shaped turrets, by enlarging the lengths of the rods in the frame by the same scale factor.



Diagram not drawn to scale

The diagram shows an example where *BuildGen* have enlarged all the lengths of the rods in the smaller frame by a scale factor of 1·6.
The area of each of the panels in the smaller frame is $4{\cdot}6\,m^2$.
The internal volume of the larger frame is $76{\cdot}2\,m^3$.

Calculate

(i) the area of each of the panels in the larger frame, [2]

(ii) the internal volume of the smaller frame. [2]

END OF PAPER

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4

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

W15-4362-02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications

HIGHER TIER

A.M. WEDNESDAY, 21 January 2015

2 hours

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

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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.

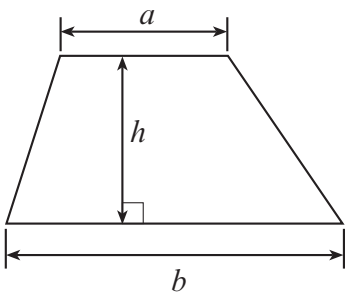
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3***(a)*.

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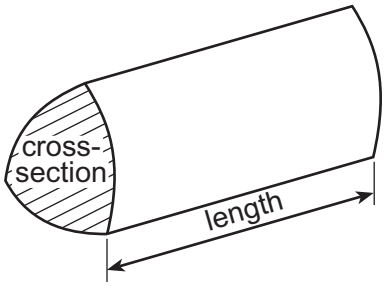
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Formula List

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

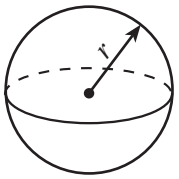


Volume of prism = area of cross-section × length



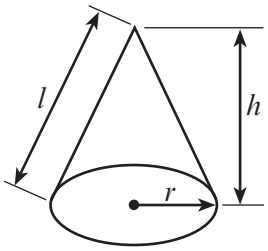
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

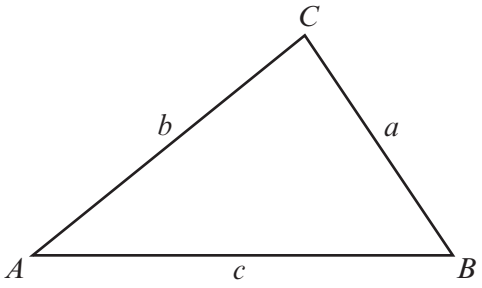


In any triangle ABC

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

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

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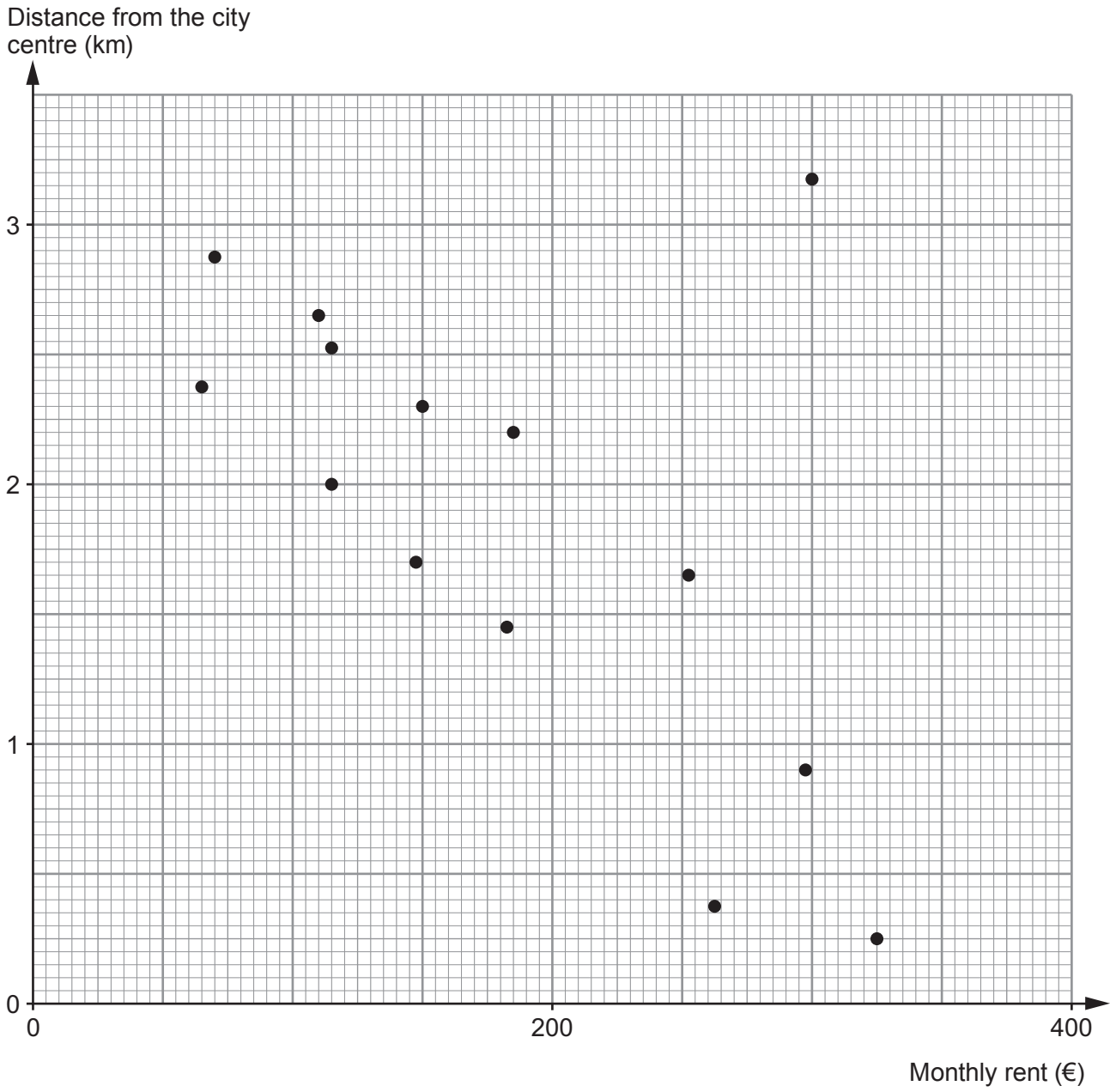
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1. The scatter diagram displays data for furnished, two-bedroom apartments in a European city. It shows the monthly rental cost and the distance the apartment is from the city centre.



(a) How much is the monthly rental cost for the most expensive apartment? [1]

..... €

(b) How much is the monthly rental cost for the apartment furthest away from the city centre? [1]

..... €

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(c) One of the apartments represented on the scatter diagram is a luxury apartment with electronic sound systems and computerised equipment.
Can you tell with certainty, from the scatter diagram, which is the luxury apartment?
You must give a reason for your answer. [1]

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(d) Draw, by eye, a line of best fit on the scatter diagram. [1]

(e) Use your line of best fit to estimate the monthly rental cost for a furnished, two-bedroom apartment 1·25 km from the city centre. [1]

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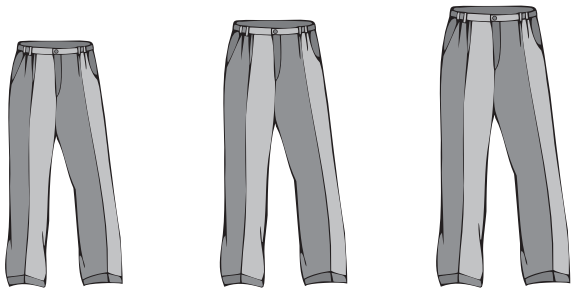
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2. Men's trousers can be bought in different sizes: small, medium and large.



The chart below gives measurements for the different sizes of trousers.

Waist measurement, in centimetres correct to the nearest cm	Waist measurement, converted into inches correct to the nearest inch	Size
66 cm to 74 cm	26 inches to ..... inches	Small
75 cm to 90 cm	..... inches to 35 inches	Medium
91 cm to ..... cm	36 inches to 49 inches	Large

1 inch is approximately 2·54 cm

(a) Fill in the missing values in the table above. [3]

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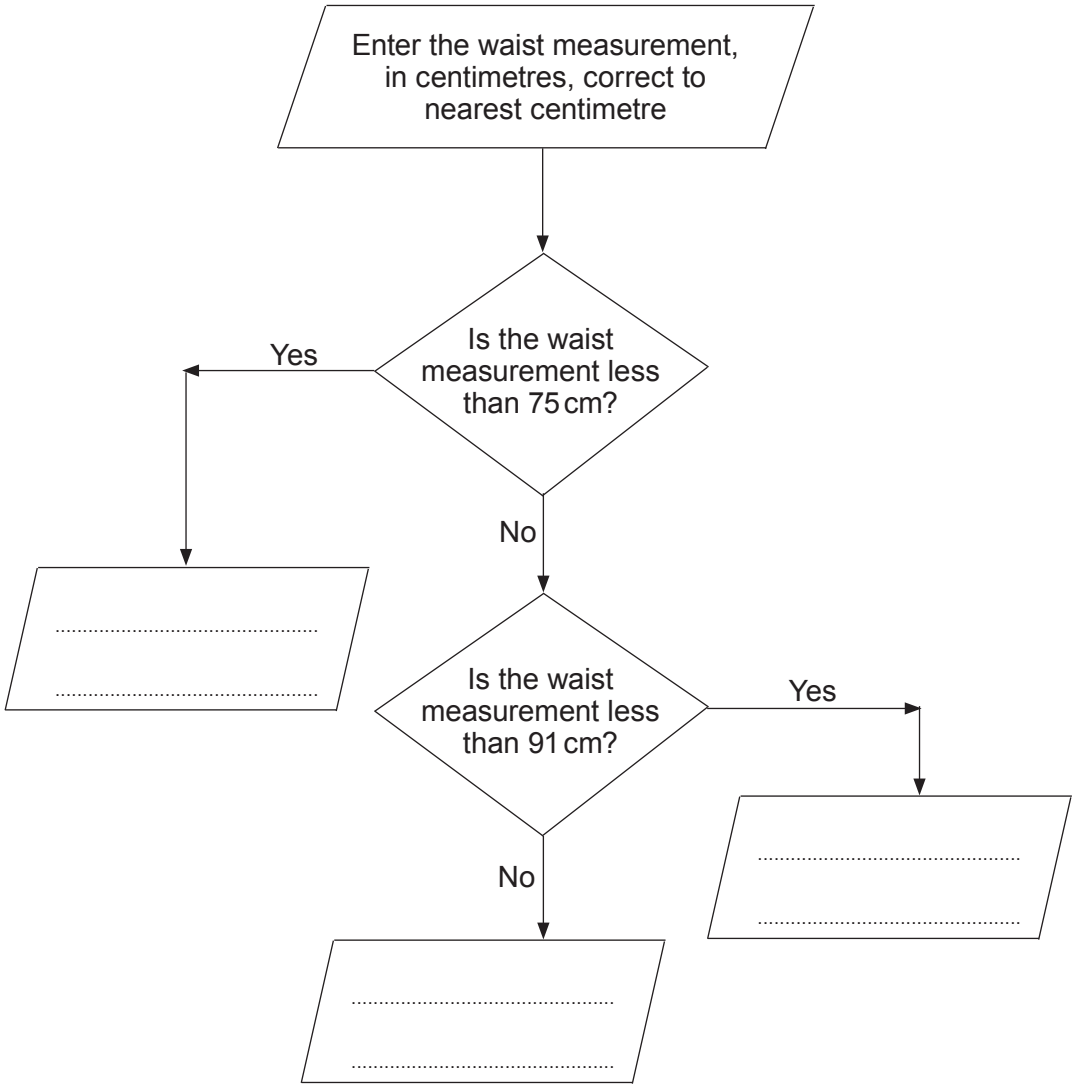
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(b) The following section of a flowchart is used to find which size trousers to buy.



Complete the three empty output boxes in the flowchart above. [2]

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3. Dewi is going on holiday to China.

He has found the following rates for exchanging pounds sterling (£) and Chinese yuan (CYN), at a local exchange bureau.

Buying Chinese yuan (CYN)	£1 buys 9.28 CYN
Selling Chinese yuan (CYN)	9.42 CYN buys £1

The exchange bureau has all the possible sterling coins and notes.
Dewi knows that the exchange bureau only sells and buys CYN notes and that no coins are available or accepted.

The bureau has many of the following CYN notes.



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

Dewi has £460 to buy Chinese yuan.

Calculate

- the maximum number of CYN Dewi can buy, and
- how much, to the nearest penny, this will cost him.

You must show all your working. [7]

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(b) It would cost Dewi £100 to buy 928 CYN.
Dewi states that he will lose money when he changes any CYN notes that he buys, back into pounds.
How much would Dewi lose in changing 928 CYN back into pounds? [3]

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4. Oil is stored in cylindrical drums.



(a) Each oil drum has a diameter of 46 cm and a height of 125 cm.
Calculate the volume of an oil drum.
Give your answer in litres. [3]

(b) A different oil drum holds 150 litres of oil.
The oil from 4500 of these drums is sold for £1.2 million.
Calculate the cost of 1 litre of this oil. [3]

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(c) A barrel contains 159 litres of oil.
This produces 1700 kilowatt hours of energy.

Complete the sentences below.

1000 kilowatt hours of energy can be produced from ..... % of a barrel of oil.

This is ..... litres of oil. [3]

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020011

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Turn over.

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5. Warren plays number games on his computer.
He keeps a record of his scores for each of *Bubble*, *Flowthru*, *Count4u* and *Splot* in a spreadsheet.
The maximum scores are shown in the section of Warren's spreadsheet shown below.
Some of the other entries are missing.

	A	B	C	D	E	F	G	H
1	**Numbers game**	**Maximum score for each game**	**Game 1**	**Game 2**	**Game 3**	**Game 4**	**Total score**	**Total score as a percentage**
2	*Bubble*	20	12	10	6	14	42	52·5
3	*Flowthru*	30	7	6	3	11	.....	.....
4	*Count4u*	10	6	4	7	6	.....	.....
5	*Splot*	4	3	1	0	.....	.....	50·0

(a) Write down a formula that could be used in the spreadsheet to calculate the entries for the following cells. [5]

G3

.....

.....

H3

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(b) Complete this section of the spreadsheet by calculating the values of the missing entries in columns F, G and H. [5]

10

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6. Margo used a stem-and-leaf diagram to record the prices of two makes of toaster, *Jenkins* and *Hollow Electric*, on display in various department stores.
Margo's stem-and-leaf diagram is shown below.

Jenkins					*Hollow Electric*			
		1	0	6	0	2		
			2	5	4			
8	7	7	6	4	3	7	8	8
	2	2	2	3	0	3		
		8	6	2	8	9		

Key: *Jenkins* 2 | 5 represents £52
Hollow Electric 2 | 9 represents £29

(a) For how many *Hollow Electric* toasters did Margo record the price? [1]

.....

(b) What is the price of the most expensive toaster that Margo recorded? [1]

.....

(c) Complete the following table.

	Median (£)	Range (£)	Mode (£)
Jenkins			
Hollow Electric			

[4]

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(d) On average, which of the two makes of toaster seems to be the cheaper?
You must give a reason for your answer. [1]

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7. Glyn employs two people, Ben and Ceri.
Ben and Ceri are paid at different hourly rates.

Glyn has recorded how many hours Ben and Ceri have worked on Monday and Tuesday.
He has also recorded the total amount he has paid out in wages.

Day	Number of hours worked		Total pay (£)
	Ben	Ceri	
Monday	6	5	116
Tuesday	4	8	138

Use an algebraic method to calculate how much Ben and Ceri are paid per hour. [6]

Ben is paid £ ..... per hour

Ceri is paid £ ..... per hour

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8. *Dragon Estate Agents* have a rectangular sign on the outside wall of their office building.



Diagram not drawn to scale

(a) The manager, Leo, wants to make badges for all staff to wear.
Leo wants the badge to be **similar** to the sign.

The height of the badge is 2·4 cm.

By calculating the length of the badge, find the area of the **badge**. [3]

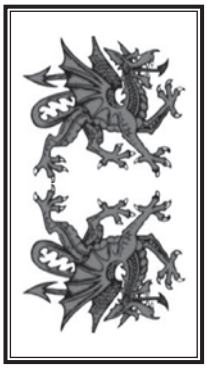
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(b) The deputy manager, Morag, says that the badge doesn't look eye-catching enough. Morag suggests a new style, as shown below.

New style of badge.



Leo says,
"I don't like the new style of badge as it has no symmetry.
The original badge with a single dragon had rotational symmetry."

Is Leo correct in his statement?
You must give a reason for your answer. [1]

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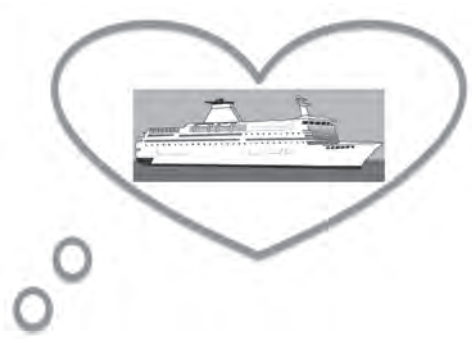
4

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9. *(a)* Bryn is planning to go on a cruise when he retires in 15 years' time.



He has £5600 to invest.
In 15 years' time, he is hoping to have £7000 to spend on the retirement cruise.
He has noticed an advertisement for a savings account paying 1·85% AER.

By investing his £5600 in the savings account for 15 years, will Bryn have £7000 to spend on the cruise?
You must show all your working. [4]

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(b) Nia wants to invest £2000.
Greenash Building Society has a savings account offering 2·18% per annum, with interest paid annually.
Downtown Building Society has a savings account offering 2·15% per annum, with interest paid monthly.

$$\text{AER \%} = 100\left(1+\frac{r}{100n}\right)^{n} - 100$$

where
n is the number of times per year that interest is paid
r is the gross interest rate as a percentage

By comparing AERs, advise which account will offer Nia the better interest on her investment.
You must show all your working. [5]

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Turn over.

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10. Thelma is selling three plots of land in an auction.
She needs to advertise the perimeters of each of the plots of land.
The sketch below shows the measurements that Thelma has taken.
She has added her notes about the shape of some of the plots.

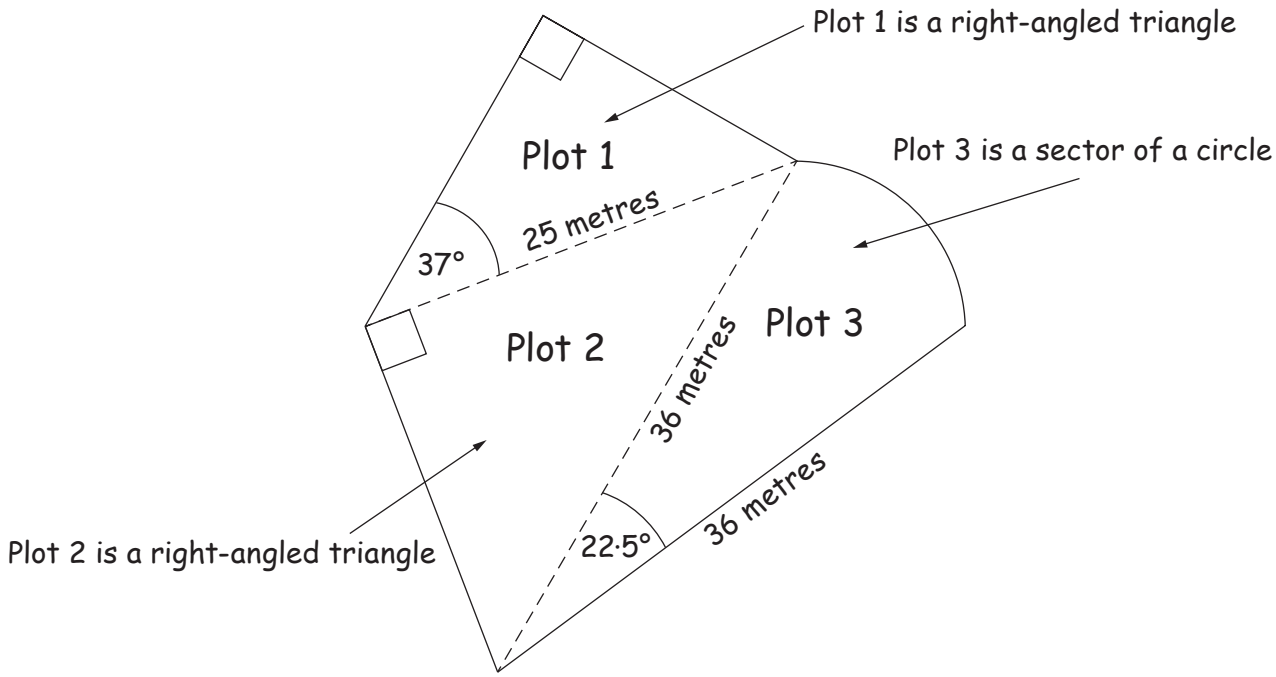


Diagram not drawn to scale

Calculate the perimeter of each of the plots of land.
Give your final answers correct to the nearest metre.
You must show all your working. [14]

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Perimeter of Plot 1 is ..... metres, correct to the nearest metre

Perimeter of Plot 2 is ..... metres, correct to the nearest metre

Perimeter of Plot 3 is ..... metres, correct to the nearest metre

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11. A DIY store sells two types of paving blocks: brown rectangular and green square.



Brown rectangular paving blocks cost £0.20 each.
Green square paving blocks cost £0.30 each.

The DIY store manager says that last week fewer than 4000 paving blocks were sold and more than £960 was taken from sales of paving blocks.

Let B represent the number of brown rectangular paving blocks sold.
Let G represent the number of green square paving blocks sold.

(a) Write down two inequalities, in terms of B and G, that satisfy the information given by the DIY store manager. [2]

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(b) Use the graph paper opposite to find a region that is satisfied by your inequalities. You must clearly indicate your region. [3]

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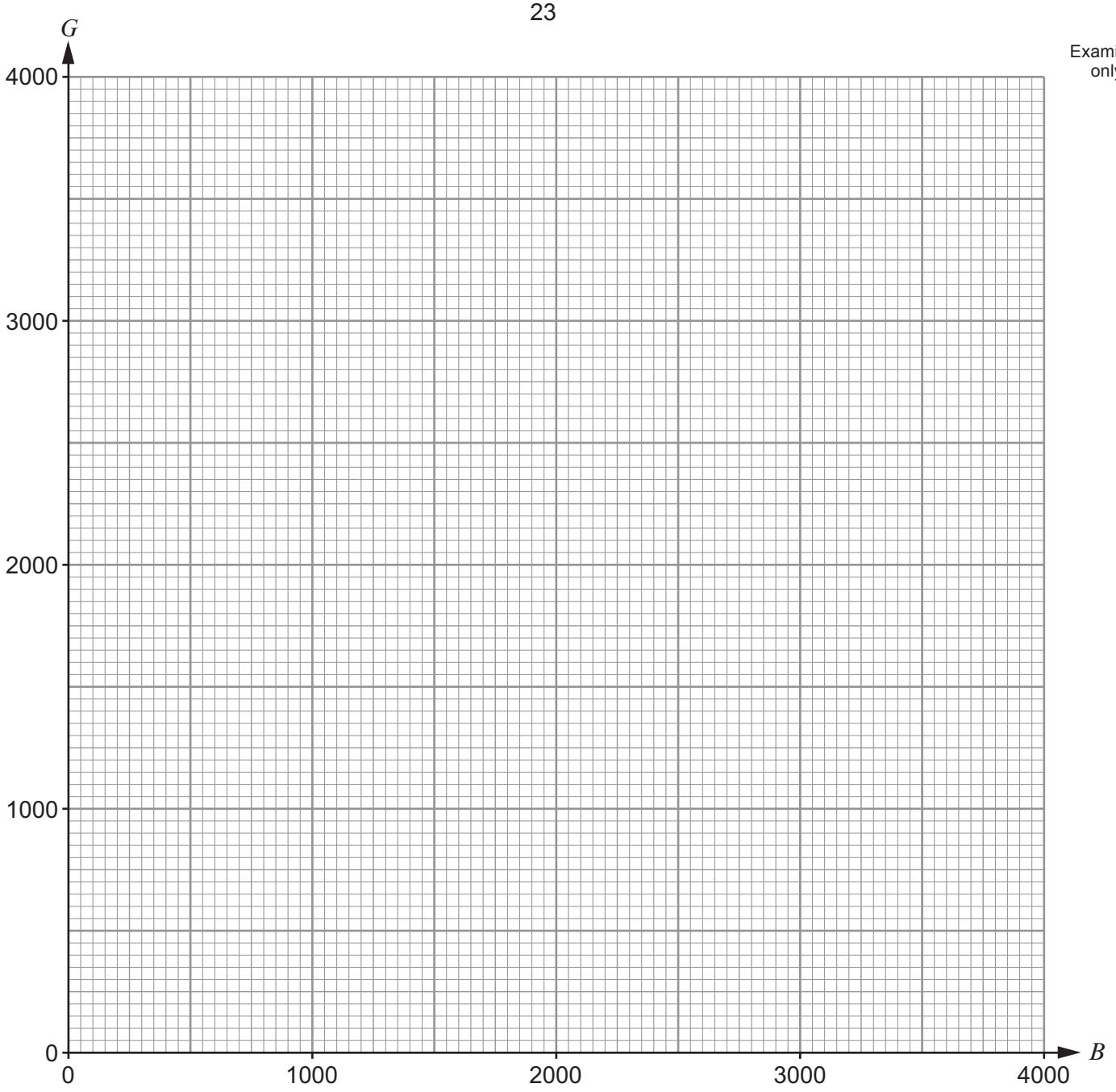
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(c) Here are some statements made by sales assistants about the sales of paving blocks last week.

Ifor said, "1500 brown and 2000 green were sold."

Simone said, "500 brown and 3000 green were sold."

Use your graph to complete the following table to indicate whether each statement could be true or not.
You **must show on your graph** how you justify your decisions. [2]

Name	Statement	Could be true? Yes or No
Ifor	1500 brown and 2000 green were sold	
Simone	500 brown and 3000 green were sold	

7

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12. The volume of water is measured as it flows into a tank.
It is found that 300 litres flows into the tank in 4 minutes.
The measurement of the volume is accurate to the nearest 5 litres.
The measurement of the time is accurate to the nearest 2 seconds.

Calculate the least and greatest rate of flow of the water.
Give your answer in litres per second, correct to 2 decimal places. [6]

Least rate of flow is ..... litres per second, to 2 decimal places.

Greatest rate of flow is ..... litres per second, to 2 decimal places.

6

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Turn over for question 13.

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13. Different formulae can be used to calculate the *CPI* and the *RPI*, and to measure inflation.
For example, there is the Carli formula and also the Dutot formula.
The Carli formula calculates the mean of relative prices, giving the Carli index.
The Dutot formula measures the ratio of mean prices, giving the Dutot index.

Example
The prices of apples are compared over a two-month period.
Prices per kg of apples in 3 different supermarkets are recorded.

	Price per kg of apples (£)	
Supermarket	1st March	1st April
A	1.20	1.20
B	0.85	0.80
C	1.00	0.90

Formulae for calculating each index for the **3 pairs of apple prices** are:

$$\text{Carli index} = \frac{\left(\frac{2^{\text{nd}}\text{ month for A}}{1^{\text{st}}\text{ month for A}} + \frac{2^{\text{nd}}\text{ month for B}}{1^{\text{st}}\text{ month for B}} + \frac{2^{\text{nd}}\text{ month for C}}{1^{\text{st}}\text{ month for C}}\right)}{3} \times 100$$

For the apple comparison:

$$\text{Carli index} = \frac{\frac{1.20}{1.20} + \frac{0.80}{0.85} + \frac{0.90}{1.00}}{3} \times 100$$

$$= (2.841176471... \div 3) \times 100$$

$$= 94.7$$

$$\text{Dutot index} = \left(\frac{\frac{2^{\text{nd}}\text{ month for A} + 2^{\text{nd}}\text{ month for B} + 2^{\text{nd}}\text{ month for C}}{3}}{\frac{1^{\text{st}}\text{ month for A} + 1^{\text{st}}\text{ month for B} + 1^{\text{st}}\text{ month for C}}{3}}\right) \times 100$$

For the apple comparison:

$$\text{Dutot index} = \frac{\frac{(1.20 + 0.80 + 0.90)}{3}}{\frac{(1.20 + 0.85 + 1.00)}{3}} \times 100$$

$$= \frac{0.96666666666...}{1.01666666666...} \times 100$$

$$= 95.1$$

Conclusion: According to the Carli index, the price of apples fell by 5.3%
According to the Dutot index, the price of apples fell by 4.9%

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(a) The prices of bananas are compared over a two-month period.
Prices per kg of bananas in **4 different supermarkets** are recorded.

	Price per kg of bananas (£)	
Supermarket	1st June	1st July
A	0.92	1.02
B	0.91	0.93
C	0.90	0.92
D	0.94	0.94

Amend the formulae given in the example and hence calculate each index for the **4 pairs of banana prices**.
You must show your working.

(i) Carli index [3]

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(ii) Dutot index [3]

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(b) Use your answers to complete these statements.

Conclusion:

According to the Carli index, the price of bananas increased by ..... %

According to the Dutot index, the price of bananas increased by ..... %

[1]

(c) How could the Dutot formula be written in its simplest form? [1]

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8

END OF PAPER

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2015 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
Unit 1 Foundation Tier	1
Unit 1 Higher Tier	4
Unit 2 Foundation Tier	8
Unit 2 Higher Tier	11

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APPLICATIONS UNIT 2
FOUNDATION TIER

<table>
<tr><th>Applications Unit 2 Foundation Tier
January 2015</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. Accept the pairs in any order

Ahmed's cards are 8 and 17
Bethan's cards are 6 and 9
Caroline's cards are 18 and 2
Doug's cards are 16 and 5</td><td>B4

4</td><td>For 4 marks, no cards should be repeated

Ignore repeats if B4 not awarded.
If all four marks not awarded then award B1 for each correct pair of cards, up to a maximum of 3 pairs of cards (B3) OR award B1 for each alternative correct pair.
eg
A: 20 & 5 or 16 & 9
C: 9 & 1
D: 20 & 9 or 17 & 6</td></tr>
<tr><td>2.(a)(i) 7
(ii) 9 + 7 + 2 + 4 + 1
23
(iii) Dog
(iv) Labels of animals
key provided
All correct using their key</td><td>B1
M1
A1
B1
B1
B1
B2

8</td><td>
Attempt to add at least 3 frequencies

If no key given, award B0 here only
FT their intended key. Award B1 for 3 or 4 correct using their key</td></tr>
<tr><td>2.(b) 47 (minutes)
(c) 3.7 + 4.2 OR 5.8 + 2.9 (=8.7)
Shortest distance 7.9 (km)

(shortest route is) from surgery via Old Road then Red Hill to Pets R Us</td><td>B1
M1
A1

E1

4</td><td>Do not accept 47 hours

FT provided M1 awarded
Intention of the route must be clear e.g. via Old Road or Old Road then Red Hill. May be indicated on the diagram.</td></tr>
<tr><td>(d)(i)
<table><tr><th>Goods</th><th>Quantity</th><th>Cost</th></tr><tr><td>Dog Basket</td><td>1</td><td>£29.99</td></tr><tr><td>Flea Spray</td><td>3</td><td>£17.97</td></tr><tr><td>Dog Treats</td><td>5</td><td>£12.45</td></tr><tr><td>Large Dog Bowl</td><td>1</td><td>£7.00</td></tr><tr><td></td><td>Total Cost</td><td>£67.41</td></tr></table>
(ii) 5/100 × (£)67.41
(£)3.3705
(£)3.37 ISW
(e) Suitable explanation given implying 40 metres for a dog collar is far too big or the units should be cm.</td><td>

B1
B1
B1

B1

M1
A1
B1
E1

8</td><td>

CAO
CAO
CAO

FT if at least one B1 awarded. Award B4 for only an answer of £67.41

FT 'their £67.41'

FT 'their 3.3705' if unrounded answer is seen.
Do not accept explanations that may be based on a lead.</td></tr>
<tr><td>3. (a)(i)
<table><tr><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>1</td><td>2</td><td>4</td><td>1</td></tr></table>
(ii) No and explanation given that shape A and/or B does not have any lines of symmetry.
(iii) C
(b) Correct reflection drawn

(c) A and G or E and C
E and C A and G

B and D</td><td>B3

E1

B1
B2

B1
B1

B1

10</td><td>Award B3 for all correct, B2 for 3 correct, B1 for 2 correct. Condone consistent use of 0 or none instead of 1. (I.e. both must be 0 or none for the mark to be awarded.)

Accept "No" being implied

B1 for straight edges correct, B1 for curve

Accept letters in either order in (c)

If the 2 previous B1 marks have not been awarded, award SC1 for an answer of A & G OR E & C in the last part instead of B & D</td></tr>
</table>

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Applications Unit 2 Foundation Tier January 2015	Mark	Comment
4. (a) $4n = 28$ (n =) 7 (b) $m/6 = 12$ (m =) 72	 B1 B1 B1 B1 4	*If no equation shown but answers given award B0 B1in each part.* Accept $28 = 4n$ or $n + n + n + n = 28$ or $n = 28/4$ or equivalent Accept embedded answers for this B1. Accept $m \div 6 = 12$ or $12 = m/6$ or $m = 12 \times 6$ or equivalent Accept embedded answers for this B1
5.(a) (Cost of bike) 1100 – 1/10 × 1100 OR 9/10 × 1100 (£)990 (b) (Save each month) 20/100 × 600 (£)120 (Number of weeks) (925 - 470) ÷ 120 3.(79..) Conclusion given that it will take 4 weeks Look for • spelling • clarity of labels • the use of notation (watch for the use "=, +, -, ×, ÷, £" being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	M1 A1 M1 A1 M1 A1 A1 Q W C 2 <

Applications Unit 2 Foundation Tier January 2015	Mark	Comment
8. (a) 325 (euros) (b) 300 (euros) (c) Idea of scatter not showing which apartment is which so there is uncertainty, e.g. 'Suggest perhaps the apartment costing 300€, ≈3.2km from the centre may be the luxury apartment but there is not information to tell us this on the scatter diagram' (d) Suitable line of best fit, in appropriate direction with points above and below the straight line drawn (e) Accurate reading **from their line of best fit**	B1 B1 E1 B1 B1 5	 Must show uncertainty in the response Intention of straight line Tolerance within a small square
9. (a) 74 / 2.54, 75 / 2. 54 or 49 x 2.54 All 3 correct answers in the table 29 (inches) 30 (inches) 124 (cm) (b) All 3 correct entries, (buy) small (buy) medium (buy) large	M1 A2 B2 5	 A1 for correct unrounded answers, (29.13… 29.52…… 124.46…..) OR for 29 and 30 OR for 124 (or allow 125 from converting backwards) B1 for any 1 or 2 correct entries
10. (a) (Change into CYN) 460 × 9.28 (No coins, so can buy only) 4268 (CYN) (Cost to Dewi for 4268 CYN is) 4268 ÷ 9.28 (£) 459.91 (b) 928 ÷ 9.42 (£)98.51(38…) (Loss) (£) 1.49	M1 A2 M1 A1 M1 A1 B1 8	 A1 for an answer of 4268.8 (CYN) or 4269(CYN) *If no marks, then SC1 for an answer of 4333 (using incorrect rate & rounding down)* FT their whole number of CYN An answer of 459.91379… implies M1, A0 FT '100 – their 98.51' provided M1 awarded
11. (G2 =) C2 + D2 + E2 + F2 OR (G2=)sum(C2:F2) (H2=) 100*G2 / (4*B2) OR 100* (C2 + D2 + E2 + F2) / (4*B2)	B1 B4 5	 Award B3 for the fraction, i.e.*100 omitted but otherwise correct, or if 1 minor slip in the formula (not for omitted *4), e.g. missing bracket(s) or a missing term, (condone × for * and ÷ for /) Award B2 for 2 errors, e.g. 100* G2 / 4*20 (missing () and use of 20 not B2), or 100* (C2 + D2 + E2 + F2) / B2 (missing 4* and ()) Award B1 for 3 errors e.g. G2 / 4*20 or (C2+D2+E2+F2) / 4*20 or G2 / 80 or (C2+D2+E2+F2) / 80

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APPLICATIONS UNIT 2
HIGHER TIER

Applications Unit 2 Higher Tier January 2015	Mark	Comment
1(a) 325 (euros) (b) 300 (euros) (c) Idea of scatter not showing which apartment is which so there is uncertainty, e.g. 'Suggest perhaps the apartment costing 300€, ≈3.2km from the centre may be the luxury apartment but there is not information to tell us this on the scatter diagram' (d) Suitable line of best fit, in appropriate direction with points above and below the straight line drawn (e) Accurate reading **from their line of best fit**	B1 B1 E1 B1 B1 5	 Must show uncertainty in the response Intention of straight line Tolerance within a small square
2(a) 74 / 2.54 75 / 2. 54 or 49 x 2.54 All 3 correct answers in the table 29 (inches) 30 (inches) 124 (cm) (b) All 3 correct entries, (buy) small (buy) medium (buy) large	M1 A2 B2 5	 A1 for correct unrounded answers, (29.13… 29.52…… 124.46…..) OR for 29 and 30 OR for 124 (allow 125 from converting backwards) B1 for any 1 or 2 correct entries Allow use of the appropriate range of measurements as the indication of size
3(a) (Change into CYN) 460 × 9.28 (No coins, so can buy only) 4268 (CYN) (Cost to Dewi for 4268 CYN is) 4268 ÷ 9.28 (£) 459.91 QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps **AND** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer (b) 928 ÷ 9.42 (£) 98.51(38…) (Loss) (£) 1.49	M1 A2 M1 A1 QWC 2 M1 A1 B1 10	 A1 for an answer of 4268.8 (CYN) or 4269(CYN) *If no marks, then SC1 for an answer of 4333 (using incorrect rate & rounding down)* FT their whole number of CYN An answer of 459.91379… implies M1, A0 QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. FT '100 – their 98.51' provided M1 awarded For B1 the answer must be to the nearest penny.

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Applications Unit 2 Higher Tier January 2015	Mark	Comment
4(a) Volume = $\pi \times 23^2 \times 125$ Answers in the range 207.6 to 207.8(…) or 208 (litres)	M1 A2	Ignore place value changes for '23' and '125' Accept 66.125 π A1 for answers in the range 207600 to 207822 or 208000(cm^3) or 207 (litres) or 66125 π *If no marks, award SC1 for use of 46 for radius giving) approximately 831 litres*
(b) 150 × 4500 × …… = 1.2 million	B1	Ignore errors for their 1.2 million providing unambiguous.
Cost per litre 1 200 000 ÷ (150 × 4500) (£)1.78	M1 A1	Calculation that could lead to a correct answer, may be shown in stages Do not accept 1.2 million ÷ (150 × 4500) for M1 unless answer of 1.7(777….) Accept 1.77(77…). If units are given they must be correct.
(c) Either (100 ×) 1000/1700 or 1000 × 159 ÷ 1700 or equivalent 58.8(%) or 59(%) Answers in the range 93.5(..litres) to 94(.. litres)	B1 B1 B1	FT their % provided initial B1 awarded Accept unsupported answer or an answer provided no inappropriate working is seen for B3
	9	
5(a) (G3 =) C3 + D3 + E3 + F3 OR (G3=) sum(C3:F3)	B1	
(H3=) 100*G3 / (4*B3) OR 100* (C3 + D3 + E3 + F3) / (4*B3)	B4	Condone × for * and ÷ for / Award B3 for the fraction, i.e.*100 omitted but otherwise correct, or if 1 minor slip in the formula (not for omitted *4), e.g. missing bracket(s) or a missing term. Award B2 for 2 errors, e.g. 100* G3 / 4*30 (missing () and use of 30 not B3), or 100* (C3 + D3 + E3 + F3) / B3 (missing 4* and ()) Award B1 for 3 errors e.g. G3 / 4*30 or (C3+D3+E3+F3) / 4*30 or G3 / 120 or (C3+D3+E3+F3) / 120
(b) G3 27 AND G4 23 (7+6+3+11)/(4 × 30) (×100) H3 22.5 H4 57.5 F5 4 AND G5 8	B1 M1 A1 B1 B1	FT their G4×100÷40 correct to 1dp CAO
	10	
6(a) 11 (b) (£)62 (c)	B1 B1	

	Median in £	Range in £	Mode in £
Jenkins	46.5(0)	35	32
Hollow Electric	47	34	48

	B4	All entries correct OR B3 for 5 correct entries B2 for 3 or 4 correct entries B1 for 1 or 2 correct entries
(d) Shows understanding that median (and range) similar, mode for Hollow Electric indicates more expensive, accept conclusion Jenkins cheaper or that the two makes are quite similar	B1	FT their table provided at least B2 previously awarded B0 if range considered as an average. Allow conclusion from their correct calculation of means: Jenkins 511 ÷12 = 42.5833… Hollow Electric 482 ÷ 11 = 43.8181…
	7	

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Applications Unit 2 Higher Tier January 2015	Mark	Comment
7. 6B + 5C = 116 AND 4B + 8C = 138	B2	B1 for either equation FT provided at least 1 equation is correct
Method to solve, e.g. equal coefficients with an appropriate attempt to subtract the equations	M1	Allow 1 slip in non equated variable
Correct first value	A1	
Method to find the second variable	m1	FT from their first value
Correct second value with indication showing order, such as completing the table, e.g. Ben (£)8.5(0) per hr, Ceri (£)13(.00) per hr	A1 6	Unsupported answers gain no marks
8(a)(Length) 6.2 × 2.4/4 or equivalent 3.7(2 cm)	M1 A1	Ignore any incorrect place value with '2.4' and '6'
(Area) 8.9(28cm^2)	A1	(2.4×3.72 = 8.928) FT 'their 3.72 × 2.4' correctly evaluated provided M1 awarded
(b) Explains he is incorrect, e.g. 'Leo is wrong it has reflection (symmetry)' or 'the original does not have (rotational) symmetry'	E1 4	Must mention the reflection (symmetry) of the new OR that the original does not have (rotational) symmetry. Allow if incorrect is stated or implied with a correct reason provided no more than one incorrect statement is given
9(a) b)5600 × 1.85/100 or 5600 × 0.0185 (= 103.60)	B1	May be embedded in further calculation
$(1 + 0.0185)^{15} \times 5600$	M1	OR sight of a full cumulative method for at least 13 years
(£) 7372(.308954…)	A1	Accept correct evaluation from at least 13years cumulative (e.g. 13years gives (£)7106(.8..) to (£)7107) *B1 and SC1 for depreciation 4231.97…, but no FT*
Conclusion, e.g. 'Yes (he will have more than he needs)'	E1	FT interpretation provided B1 and M1 awarded *If M0 awarded and simple interest used with interest shown or implied as over (£)1400 for 14 or 15 years award SC1 or with conclusion 'Yes' award SC2.* *If also stated that using compound interest the amount will be greater award SC3*
(b) (AER% =) $100\left(1 + \frac{2.15}{100 \times 12}\right)^{12} - 100$ OR $100(1 + 2.15 \div (100 \times 12))^{12} - 100$ = 2.17(…..%)	B4	For B4 condone missing brackets in the denominator if the answer correct. Award B3 for correct formula (including brackets in the denominator) but incorrect answer between 1 and 5 inclusive. Award B2 for correct formula and answer not between 1 and 5. Award B1 for one error in the formula e.g. missing brackets, 2000 not 100, a 12 missing, 0.0215 used.
Advise, e.g. 'Greenash as more interest (at 2.18%p.a.)'	E1 9	FT their appropriate interpretation provided at least B2 awarded and APR for Greenash is 2.18%.

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Applications Unit 2 Higher Tier January 2015	Mark	Comment
10. Plot 1 Opposite side = 25 × sin 37 Opposite side 15(.04537…metres) Adjacent side = 25 × cos 37 Adjacent side = 19.9658…metres or 20 (metres) Perimeter Plot 1 (25 + 15 + 20 =) 60 (metres) Plot 2 unknown^2 = 36^2 - 25^2 unknown length 25.9(036.. metres) or 26(metres) Perimeter Plot 2 (25 + 36 + 26=) 87 (metres) Plot 3 Strategy, considers fraction of a circle OR sight of 2×π×36 Arc = 2× π × 36 × 22.5/360 Answers between 14 (metres) to14.14…(metres) inclusive Perimeter Plot 3 (36 + 36 + 14 =) 86 (metres)	M2 A1 M2 A1 B1 M1 A1 B1 S1 M1 A1 B1 14	M1 for sin37 = opposite side/25 M1 for cos37 = adjacent side/25 Accept rounded or truncated to 19.97 or 19.96 or 19.9 or 20.0 *Alternative 3 marks once opposite or adjacent side found are:* *$25^2 - opp^2 = adj^2$ or $25^2 - adj^2 = opp^2$* *Substitution of 25 and their(FT) appropriate measurement M1* *opp^2 =226.36… or opp=√226.36… or adj^2 = 398.6(3…) or adj = √398.6(3…) or FT with their appropriate measurement A1* *Opposite or adjacent as before or FT A1* FT provided at least 1 method mark for each stage of Plot 1 working has been awarded FT provided at least M1 for Plot 2 awarded OR equivalent to 72π or a fraction (percentage) of 72π in working An answer of 226.(.. metres) implies S1 only (Allow 9pi/2) FT provided at least S1 awarded for Plot 3 <u>Do not penalise not rounding each perimeter to the nearest metre more than once, i.e. first B0 then FT to allow unrounded for further B marks</u>
11(a) G + B < 4000 0.3(0)G + 0.2(0)B > 960 (b) Line G + B= 4000 shown Line 0.3G + 0.2B=960 shown Region between the lines indicated (left hand end only) (c) **Using their graph** to show Ifor's point outside the region with 'No' in the table **Using their graph** to show Simone's point inside the region with 'Yes' in the table	B1 B1 B1 B1 B1 B1 B1 7	*If no marks, then SC1 for G+B…4000 AND (0.)3(0)G +(0.)2(0)B…960, with the gaps here both being inequalities* FT from their inequalities if possible Accept FT from either line correct but for a similar region **MUST** be a FT from their (non spurious) graph in (c) Do not accept numerical explanations. Accept unambiguous unlabelled plots provided the table is completed correctly
12. Sight of 297.5 and 302.5 (litres) AND 239 and 241 (seconds) (Least) 297.5/241 1.23 (litres per second) (Greatest) 302.5/239 1.27 (litres per second)	B2 M1 A1 M1 A1 6	B1 for any 2 of these FT their litres and seconds provided neither 300 nor 240 used, and appropriately > or < these values *If neither A mark awarded, then SC1 for unrounded or truncated answers (greatest 1.26569… AND least 1.2344…)*

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Applications Unit 2 Higher Tier January 2015	Mark	Comment
13. (a)(i) Carli index $\left(\frac{\frac{1.02}{0.92}+\frac{0.93}{0.91}+\frac{0.92}{0.90}+\frac{0.94}{0.94}}{4}\right)\times 100$ 103.8(2239…)	M1 A2	*Ignore irrelevant missing zeros for pence throughout* Correct formula and substitution A1 for 4.15(289…)(÷4 ×100)
(ii) Dutot index $\left(\frac{\frac{1.02+0.93+0.92+0.94}{4}}{\frac{0.92+0.91+0.90+0.94}{4}}\right)\times 100$ 103.8(147..)	M1 A2	Correct formula and substitution, both ÷4 may be omitted, however if ÷3 shown in the formula M0 A1 for 3.81/ 3.67 (×100) or 0.9525/ 0.9175 (×100) *If no marks then* • *for answers from inverting substitution, SC1 for Carli 96.46… or 96.5, and SC1 for Dutot 96.325…* • *for answers from showing ÷3, SC1 for Carli 138.3… or 138.4.., and SC1 for Dutot 103.8..(or 104 from 1.27÷1.22(33…)*
(b) 3.8(%) AND 3.8(%)	B1	FT for their difference from 100 provided at least 1 mark awarded in each of (a)(i) and (a)(ii) Accept any indication of this knowledge
(c) Indicates that the division by the number of supermarkets on the numerator and the denominator are common and can be cancelled or omitted	E1	(Allow in words)
	8	

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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, 19 June 2014

2 hours

4362
020001

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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 **2***(b)*.

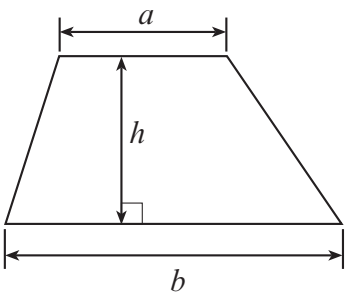
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**11**	
3.	**7**	
4.	**9**	
5.	**8**	
6.	**9**	
7.	**12**	
8.	**4**	
9.	**4**	
10.	**3**	
11.	**11**	
12.	**7**	
13.	**11**	
Total	**100**	

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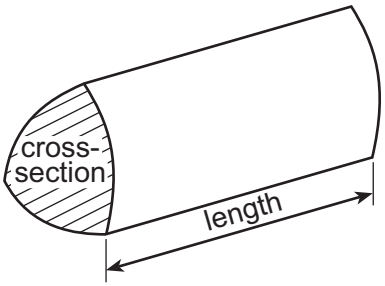
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Formula List

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

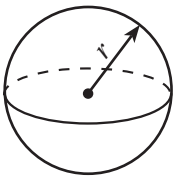


Volume of prism = area of cross-section × length



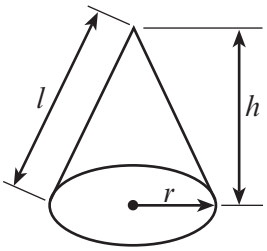
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

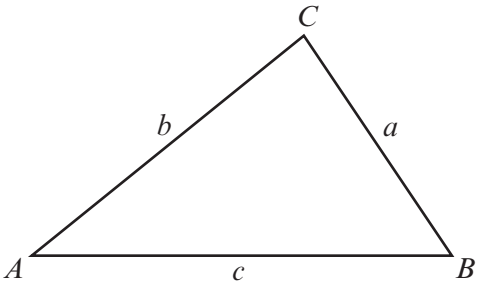


In any triangle ABC

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

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

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1.



At the time when the pyramids were built, the Egyptians used different measures from those we use today.

It is believed that

1 pyramid inch = 1·0010846752 inches
1 pyramid cubit = 25 pyramid inches.

We also know that

1 inch = 2·54 cm.

Complete the following table. [4]

Measure	Equivalent to
1 pyramid cubit	..... inches, correct to 3 decimal places
1 pyramid inch	..... cm, correct to 4 significant figures

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2. *(a)* Frankie has a number of chocolate bars that are wrapped in colourful packaging.



Frankie asked herself the question shown above.
A section of the spreadsheet that Frankie created is shown below.

	A	B	C	D	E
1	Name of chocolate bar	Chocolate bar weight (g)	Packaging weight (g)	Total weight (g)	Chocolate bar weight as a percentage of the total weight
2	Chokkie Dream	345	165		67·65
3	Air Bubbly	235	140	375	
4	Dark Bite	200	120	320	62·50

Frankie has written some of the formulae to complete the spreadsheet, but some are missing.
Write down the formulae that are needed to complete the following cells.

(i) **D2** [1]

.....

(ii) **E3** [2]

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

The table below shows the carbohydrate content of *Crackly Bars*.

Crackly Bars		
	per 100 g	per bar
Carbohydrate	64·5 g	15·48 g

Crackly Bars are sold in 360 g packs.
Calculate how many bars there are in a pack.
You must show all your working. [5]

(c) Snack size *Crackly Bars* are made using the same recipe.
Snack size *Crackly Bars* are sold in 85 g packs.

Complete the table for 85 g packs of snack size *Crackly Bars*.
Give your answer **correct to an appropriate degree of accuracy**. [3]

Crackly Bars		
	per 100 g	per 85 g pack
Carbohydrate	64·5 g	..... g

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3.

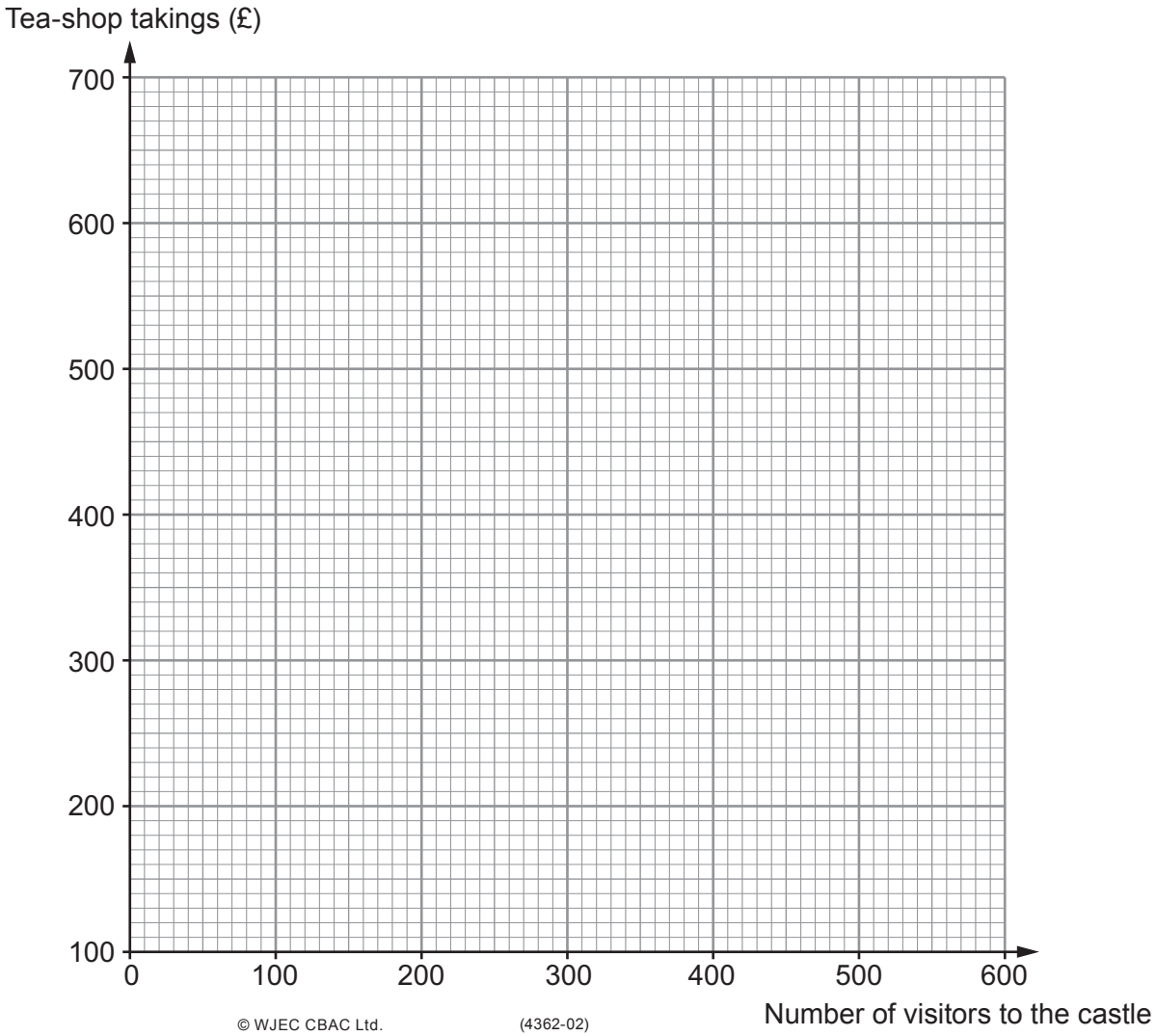


The manager of a tea-shop at a castle kept some records every day for 7 days.
The manager recorded:

- The number of visitors to the castle.
- The total money taken at the tea-shop.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of visitors to the castle	120	180	400	320	460	550	420
Tea-shop takings (£)	150	230	500	380	560	660	490

(a) On the graph paper provided, draw a scatter diagram of these results. [2]



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(b) Draw, by eye, a line of best fit on your scatter diagram opposite. [1]

(c) Describe the correlation between the number of visitors to the castle and the tea-shop takings. [1]

.....

(d) The manager of the tea-shop states,

'My records tell me that each visitor to the castle spends more than £1 each at the tea-shop.'

(i) Explain why the manager might have come to this conclusion. [2]

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(ii) The statement is not necessarily true.
Explain why this statement may not be true. [1]

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4.





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(a) Selwyn used a stem-and-leaf diagram to record the prices of two makes of suitcases on display in a luggage shop.
Selwyn's stem-and-leaf diagram is shown below.

Subidas		Dinkey
7 1	8	1 5
6	7	2 5
8 7	6	1 6 7
6 3	5	4 4 4
6 2 2 1	4	5

Key: Subidas 3 | 5 means £53
Dinkey 5 | 4 means £54

(i) What is the price and make of the most expensive suitcase? [1]

Price: £ .....

Make: .....

(ii) Complete the following table. [4]

	Median in £	Range in £	Mode in £
Subidas			
Dinkey			

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(iii) On average, which make of suitcase is the more expensive?
You must give a reason for your answer. [1]

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(b) The luggage shop owner has illustrated, in a pictogram, the number of suitcases sold in a week.



Key:  is 20 suitcases

(i) Selwyn looks at the pictogram and says,

'The number of suitcases sold on Sunday was 40% higher than the number of suitcases sold on Wednesday.'

Is Selwyn correct?
You must show all your working to justify your answer. [2]

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(ii) Looking at the pictogram again, Selwyn says,

'More money was spent on buying suitcases in this shop on Sunday than on any other day.'

Is Selwyn correct?
You must give a reason for your answer. [1]

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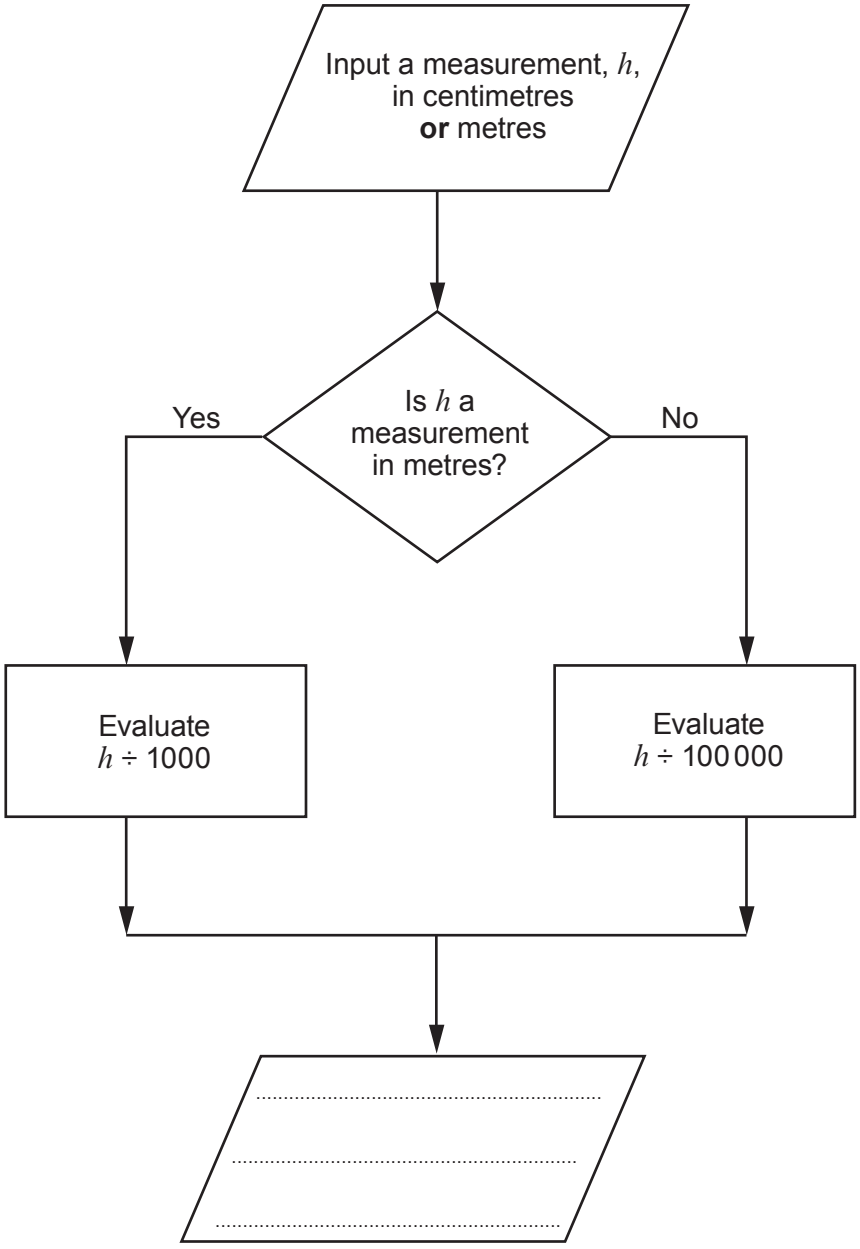
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5. *(a)* The following is a section of a flowchart.



What would this section of the flowchart be used for?
Give an example of what might be written in the output box. [2]

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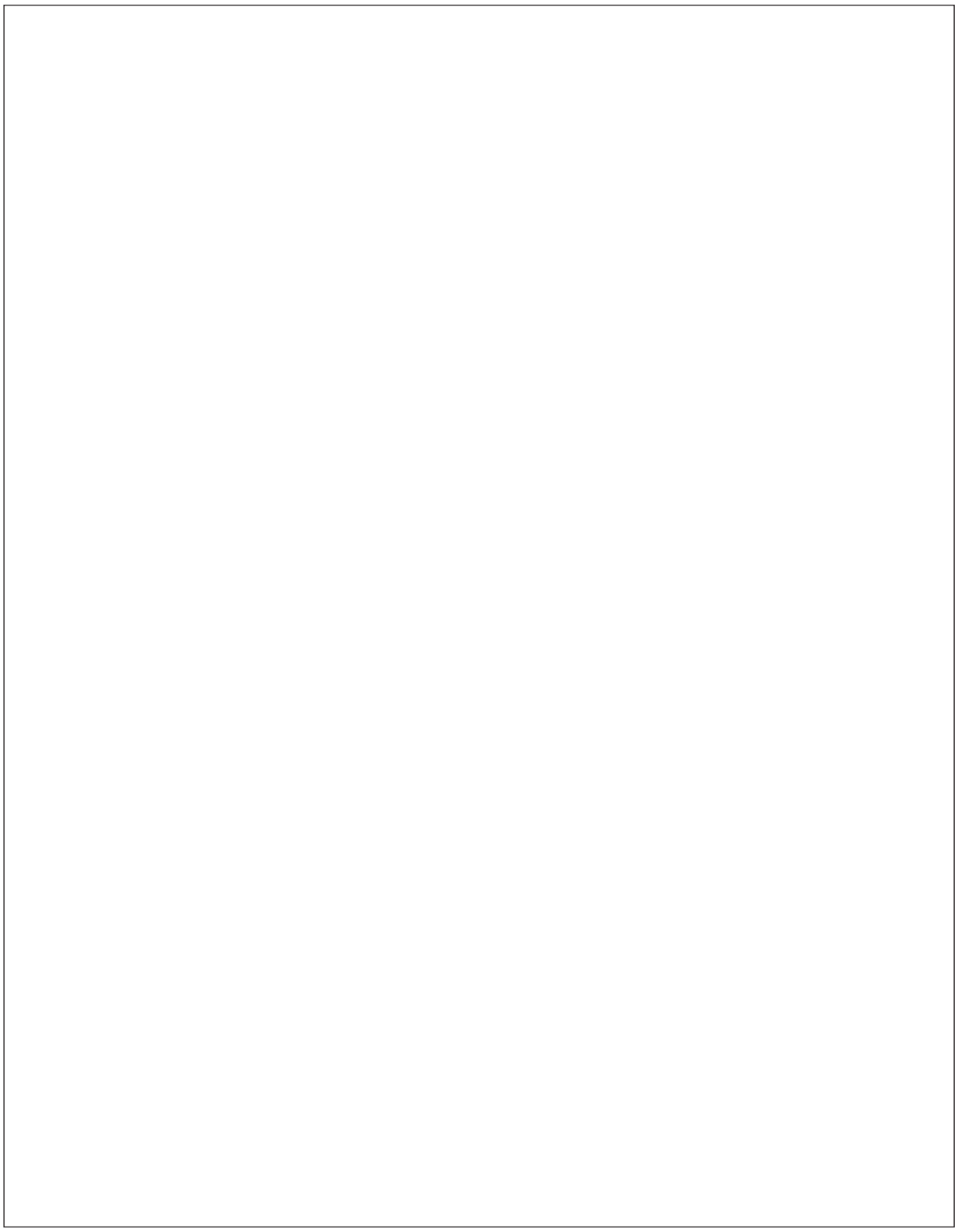
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(b) In the box below construct a section of a flowchart that would:

- Allow input of whole numbers
- Add 1 to any odd number
- Not change even numbers
- Allow the output of only even numbers. [6]



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6. Levi owns a snack bar.
All the sandwiches are the same price and all the drinks are the same price.



During the first hour of the day, Levi sells 3 sandwiches and 2 drinks costing £7.20 altogether.
During the second hour of the day, Levi sells 2 sandwiches and 5 drinks costing £8.10 altogether.

Levi writes down the following simultaneous equations:

$$3x + 2y = 720$$
$$2x + 5y = 810.$$

(a) What do the x and y represent in Levi's equations? [2]

x represents .....

y represents .....

(b) Solve the simultaneous equations using an algebraic method. [4]

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(c)



Levi also sells bags of crisps.
He sells a bag of crisps for £1.68.
He makes a profit of 12% on the cost price of a bag of crisps.

He buys the bags of crisps in boxes.
Each box contains 10 bags of crisps.

Calculate the cost price of a **box** of crisps. [3]

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7. Thutmose lives in Egypt and has an interest in pyramids.



(a) The Egyptians built right pyramids.
Thutmose visits a pyramid that has a square base measuring 230 metres by 230 metres.
The vertical height of this pyramid is 146 metres.
Thutmose makes his way up from the ground to the top of the pyramid along one of the sloping edges.

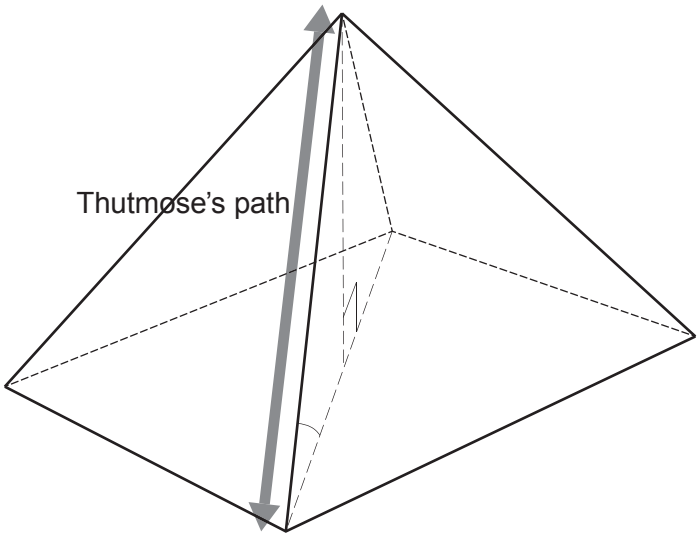


Diagram not drawn to scale

(i) Calculate the length of Thutmose's path along the edge of the pyramid, as shown in the diagram above. [5]

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(ii) Calculate the angle of elevation of Thutmose's path with the horizontal ground, as shown in the diagram opposite. [3]

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(b) Thutmose noticed that two different pyramids have 2 triangular faces that are **similar** when viewed from a distance.



He used a photograph to sketch the 2 similar triangles, as shown below.

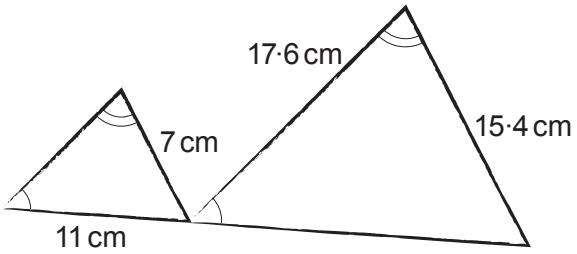


Diagram not drawn to scale

Calculate the missing lengths on the smaller and on the larger triangle. [4]

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8. A restaurant needs some new pieces of crockery.
The crockery the restaurant needs are dishes and plates.



The dishes and plates are available to buy in packs.
There are 3 dishes or 2 plates in each pack.
The restaurant cannot afford to buy more than 25 packs altogether.
The restaurant wants to buy at least 60 new pieces of crockery.

The information given can be represented by the inequalities,

$$d + p \leqslant 25$$
$$3d + 2p \geqslant 60$$

where,

- d represents the number of packs of new dishes bought, and
- p represents the number of packs of new plates bought.

(a) Use the graph paper opposite to find the region that is satisfied by the inequalities. [3]

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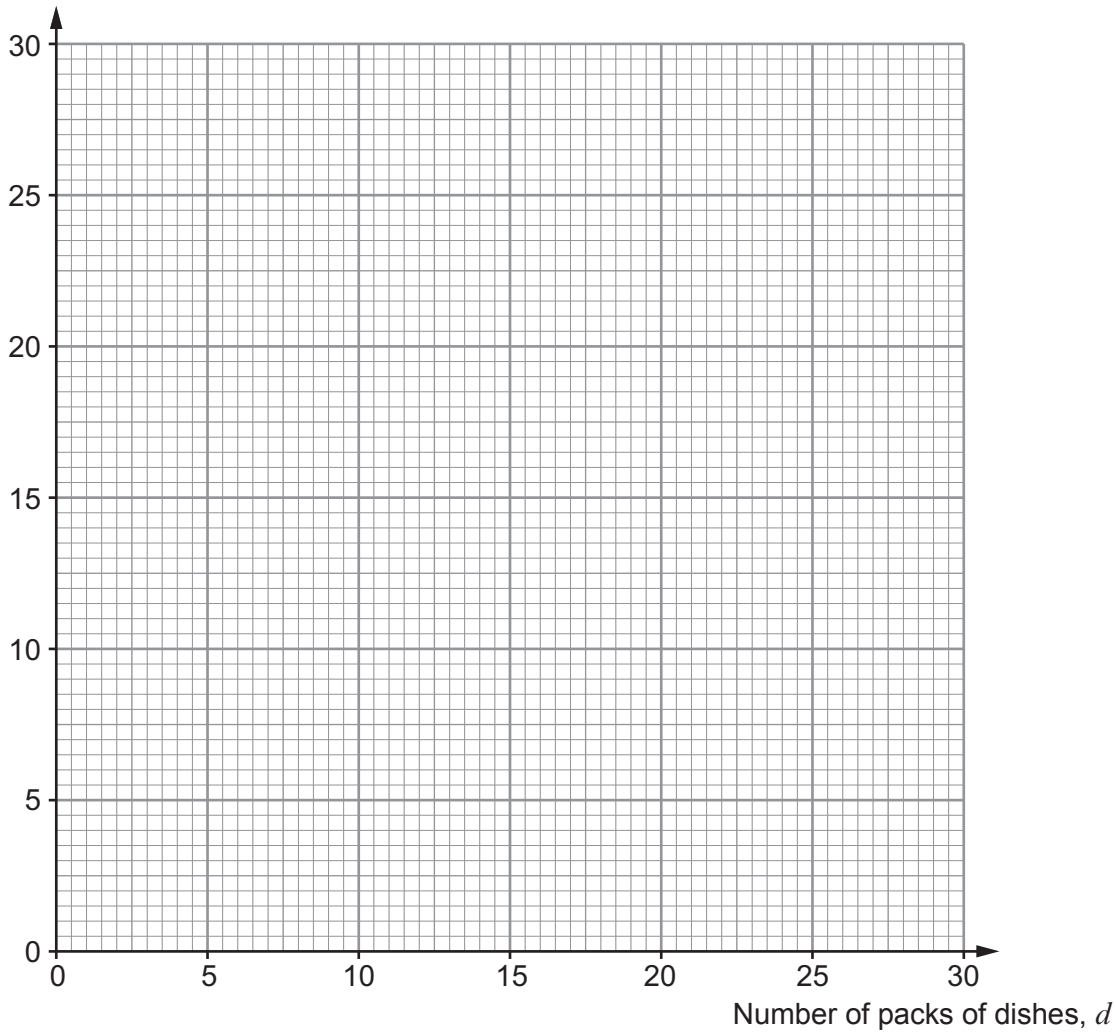
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Number of packs of plates, p



(b) The restaurant decides to order some dishes **and** some plates.
Complete the order form below by selecting a suitable number of packs of dishes and packs of plates for the restaurant to buy. [1]

Crockery	Number of packs to buy
Dishes	
Plates	

.....

.....

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9. Issi lives in the UK.
Her friend Thierry lives in France.
They are both going on holiday to America.

Thierry is offered an exchange rate of 1 euro to 1.29 dollars.
Issi is offered an exchange rate of £1 to 1.61 dollars.

Issi states

'Using these exchange rates, £1 is worth ..... euros.'

Complete Issi's sentence.
You must show all your working. [4]

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10. An engineering company makes metal parts for engines.
The diagram below shows the design for a split-disc.
The split-disc is drawn as two concentric circles, each with centre *O*.
Both *OAB* and *ODC* are straight lines.

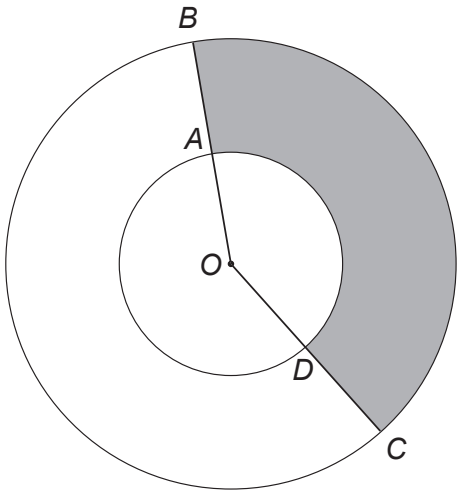


Diagram not drawn to scale

It is known that $A\hat{O}D = 142°$ and $OA = AB = 1{\cdot}8\,\text{cm}$.
The company needs to know the area of the shaded surface *BCDA*.
Calculate this area. [3]

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11. *(a)*

Account	**AER** Annual Equivalent Rate
Eagle Saver	5·2%

Cledwyn has been given £450.
He decides to invest £450 in the *Eagle Saver* account for 4 years.
The *Eagle Saver* account pays an AER of 5·2% p.a.
Will Cledwyn have sufficient money in his *Eagle Saver* account to be able to buy a television costing £550 in 4 years time?
You must show all your working and give a reason for your answer. [4]

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(b) Cledwyn is also interested in opening a savings account.
Cledwyn has some details of a *Kite Saver* account.

Account	**Nominal interest rate**	**AER** Annual Equivalent Rate, correct to 2 decimal places
Kite Saver	6·8% p.a. paid quarterly	..... %

(i) Write 6·8% as a decimal. [1]

.....

(ii) Would you expect the AER for the *Kite Saver* account to be greater than, equal to, or less than 6·8%?
Tick (✓) one of the boxes below.
Without doing any calculations, give an explanation for your answer. [1]

Greater than 6·8% ☐ Equal to 6·8% ☐ Less than 6·8% ☐

.....

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(iii) In the table above, complete the AER column, correct to 2 decimal places, for the *Kite Saver* account using the following information.
AER, as a decimal, is calculated using the formula $\left(1+\frac{i}{n}\right)^n - 1$,
where
i is the nominal interest rate per annum **as a decimal** and
n is the number of compounding periods per annum. [4]

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(iv) Explain why banks use AER. [1]

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12. *(a)* A substance **loses** $\frac{1}{4}$ of its mass every second.

Its initial mass is 2500 grams.

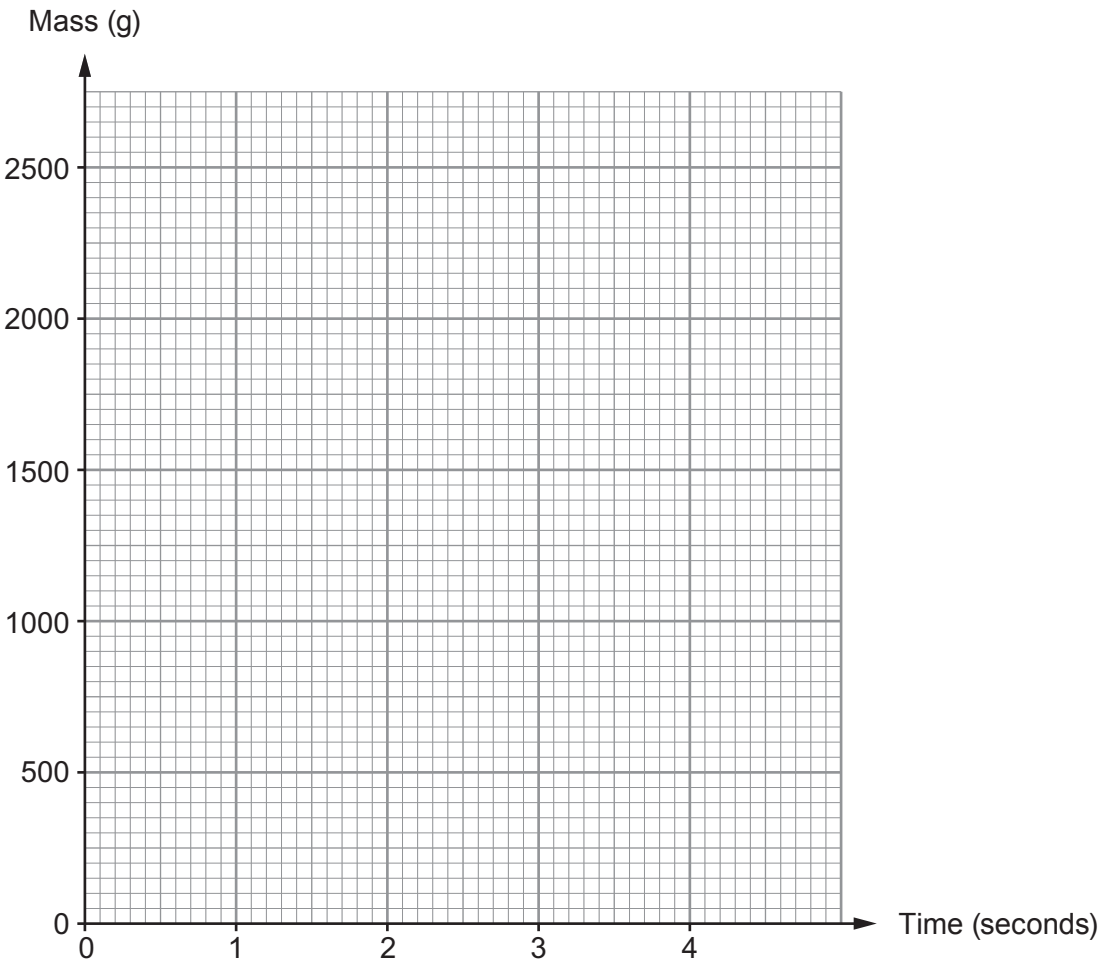
(i) Use the graph paper below to draw a graph showing the decreasing mass during the first 4 seconds. [3]

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(ii) After how many seconds will the mass be 1500 grams? [1]

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(b) A substance has an initial mass m grams.
It loses a quarter of its mass every second.
Write down a formula for finding the final mass, f grams, of the substance after 5 seconds. [3]

.....

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Examiner only

13. *(a)* The company *Aqua24/7* fills plastic water bottles.



The company fills 3000 one-litre water bottles per hour.
The process is continuous for 12 hours each day.

(i) Calculate the rate of filling water bottles per minute.
State the unit of your answer. [2]

.....

.....

.....

(ii) Calculate the number of water bottles filled during one working day.
You must give your answer in standard form. [2]

.....

.....

.....

.....

(b) Aluminium water bottles can be reused more safely than plastic water bottles.
Aqua24/7 decides to make aluminium water bottles.
The design of the aluminium water bottle is based on two parts, attaching a hemisphere onto a cylinder.



Diagram not drawn to scale

The inside diameter of the aluminium water bottle is 8 cm.
It holds 1 litre of water when filled to the top, including filling the hemispherical part.

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(i) For the aluminium water bottle, calculate
- the inside height of the cylindrical part, and
- the overall inside height. [6]

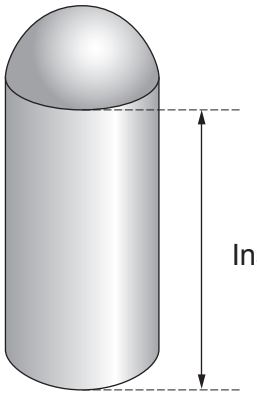


Diagram not drawn to scale

Inside height of the cylindrical part: .....

Overall inside height: .....

(ii) In practice, do you think a bottle made with these dimensions will actually hold 1 litre of water?
You must give a reason for your answer. [1]

END OF PAPER

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE APPLICATIONS OF MATHEMTICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 - Foundation Tier	1
Unit 1 - Higher Tier	5
Unit 2 - Foundation Tier	10
Unit 2 - Higher Tier	15

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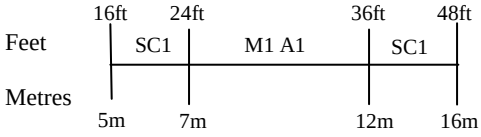
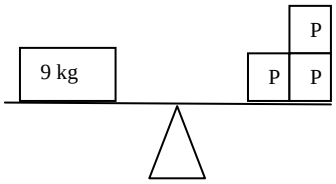
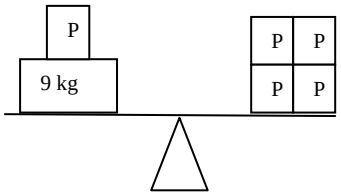
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UNIT 2 (FOUNDATION TIER)

Applications Unit 2 Foundation Tier June 2014	Mark	Comment
1. Cabbage 8, Peas 13, Sprouts 6, Broccoli 3	B2	May be inferred from their bar chart. B1 for any two/three correct frequencies. If frequencies score 0, then give B1 for all 4 correct tallies.
Both axes labelled, e.g. frequency or number of people along one axis and Cabbage, Peas, Sprouts, Broccoli along the other axis (or on the bars), anywhere within the base (inc) of the corres. bar AND uniform scale for the frequency axis starting at 0.	B2	B1 if no scale but allow one square to represent 1 OR B1 if not labelled as 'frequency' or similar. If frequency scale starts with 1 at the top of the first square the starting at 0 will be implied for this axis. **<u>Condone frequency numbers alongside square instead of at the top of the squares.</u>**
Four bars at correct heights (bars must be of equal width). Can be in any order.	B2 6	FT their frequencies throughout. FT their scale. B1 for any 2 or 3 correct bars on FT.
2. (Cost of bracelets) (200 × 6.30) (£)1260 (number of bracelets sold at higher price) 60/100 × 200 120 (sale of 120 bracelets) (120 × (£)9.99 =) (£)1198.8(0) (sale of 80 bracelets) (80 × (£)3.98 =) (£)318.4(0) (sale of all 200 bracelets) (£)1517.2(0) (Profit of) (£)257.2(0)	B1 M1 A1 B1 B1 B1 B1	FT 'their 120' FT 200 –' their 120' but not 120 FT 'their 120 × (£)9.99' + 'their 80 (but not 120) × (£)3.98' FT 'their 1260' AND 'their 1517.2(0)'
Look for • Spelling • Clarity of text explanation • the use of notation, watch for the use of '=', '£', 'pence' being appropriate For QWC2 labels, appropriate use of '=' and units (£) must be evident. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	QWC 2 9	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

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Applications Unit 2 Foundation Tier June 2014	Mark	Comment
3. (b) Car 4ft to 6ft OR 1.2m to 2m Car 2.5(cm) house 15(cm) Multiplying factor = 6 OR Multiplying factor if door used = 3.75 (allow 3.7 – 3.8) Height of house = Car's estimate × their SF (4 to 8) OR height of house = Door's estimate × their SF (1.75 to 5.75) = *correct answer for their figures* For B0(or B1), B0, M0, A0 <u>Award SC1 for answers which:</u> • only give car's height as 2.5 cm **and** height of house as 15 cm **OR** • proper attempt at 'dividing' the height of the house into equal parts.	B1 B1 M1 A1 4	 FT if height of door is used to estimate the height of the house instead of height of car. Door 4(cm) house 15(cm) FT their car's estimate AND scale factors 4 to 8 inc Correct units (feet or metres) must be seen at least once to get the final A1 Unsupported answers mark as follows (Candidates may be awarded the first B1 mark too): 
4. H and L F and N G and P B and K Any 2 shapes from A, C, D and I	B1 B1 B1 B1 B1 5	Order of letters not important
5. Two numbers or letters such that Q – P = 9 or Q = 9 + P Two numbers or letters such that Q = 4P P = 3 (kg) Q = 12 (kg)	 B1 B1 B1 B1 4	*Alternative method* For B2 first diagram OR P + P + P = 9  OR for B1 second diagram OR P + 9 = P + P + P + P 
6. (a) Weight of a man 90 kg Length of a rugby pitch 122 m Volume of a bottle of water 75 cl Speed of a sprinter over 100 metres 9 m/s	B1 B1 B1 B1 4	

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Applications Unit 2 Foundation Tier June 2014	Mark	Comment
7. (a) Labour AND Conservative (b) Conservative OR Labour 13 + 4 + 18 OR 6 + 6 + 5 + 13 Conservative 35 (years) Labour 30 (years) (c) $^{30}/_{65}$ (ISW) (d) Explanation relating to number of years not being exact.	B1 M1 A1 A1 B2 B1 7	 Answers of 35 for Conservative or 30 for Labour implies M1 FT 65 – 'their Conservative' or FT 'their Labour'. FT 'their conservative + Labour' as denominator. There must be a consistent FT for numerator and denominator, e.g. if Labour given as 29 and answer given as 29/65 award B1 only. B1 for denominator of 65 or B1 for numerator of 30 in a fraction less than 1. Award B1 for 30 out of 65 OR 0.46(1538461) E.g. 'One year could be May, another year in December' OR '1945 to 1951 could be anything from 5 to 7 years' OR 'could be at different times within a year'.
8. (a) (i) -8(˚C) (ii) 15(˚C) (b) (i) 800 × 1.59 ($) 1272 (dollars) (ii) 456 ÷ 1.59 = (£)287	B1 B1 M1 A1 M1 A2 7	Do not accept Wednesday Accept -15(˚C). *Watch for answer to greatest daily range of 9(˚C)* Award A1 for (£)286(.7924528)
9. **P son** / **Should have flu vaccination? Yes or No** / **Reason** Denise / Ye / Is a diabetic Jack / Yes / Is over 65 and/or has a chest condition David / No / Does not meet any requirements or equivalent, OR gives at least 2 reasons for not having the flu jab. Alys / Yes / Is pregnant	B4 4	Award B1 for each correct response and valid reason. Award SC2 for ALL CORRECT reasons with ALL INCORRECT Yes/No. If no marks awarded, award SC1 for Yes, Yes, No, Yes
10. (Units used =) 911 (cost of units =) 911 × 24.7 (÷ 100) (£)225.017 or 22501.7(p) (Charge for days =) (£)28.52 or 2852(p) (Total =) (£)253.537 or 25353.7(p) (Total bill =) (£) 253.54 or 25354(p)	B1 M1 A1 B1 B1 B1 6	CAO FT their number of units if subtraction has taken place. Accept (£)225.02 or 22502(p) If B0 M0 A0 awarded, award SC1 for correct evaluation of their number of units × 24.7 (÷100) FT their figures. Accept rounded or truncated but no mix of units Answer must be rounded correct to the nearest penny. FT any answer that requires rounding and has been rounded correctly and units have not been mixed. If units are given, they must be correct. *Penalise once only for incorrect use of units.*

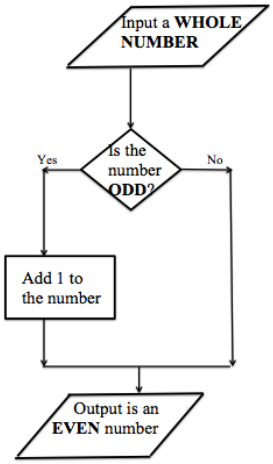
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Applications Unit 2 Foundation Tier June 2014	Mark	Comment
11. (a) All 7 points plotted correctly, not joined	B2	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined
(b) Reasonable straight line of best fit by eye, some points above and below	B1	Do not accept through intersection of the axes
(c) Positive	B1	Accept appropriate descriptions
(d)(i) Example of 'takings' ÷ 'number of visitors' or decision to **compare takings with number of visitors**	B1	
Manager might think 'takings' ÷ 'number of visitors' is valid which always gives a result >£1, or comparison with **conclusion that takings is always greater than number of visitors**	E1	
(ii) Explanation, e.g." 'takings' ÷ 'number of visitors' is not valid because **some visitors may not even visit the tea shop,** (so they spend £0, also some visitors may spend a lot less than £1 and other spending much more than £1)"	E1	Or states that 'takings' ÷ 'number of visitors' is not valid Accept 'some visitors may not spend anything in the tea shop', also accept a reason based on some people spending <£1 and some >£1.
	7	
12. (a)(i) 87 AND Subidas	B1	Do not accept indication on the diagram unless 87 seen
(ii) Median in £ / Range in £ / Mode in £ Subidas: 56 / 46 / 42 Dinkey: 66 / 40 / 54	B4	Median, mode and range correct, OR B3 for 4 or 5 correct entries B2 for 3 correct entries B1 for 1 or 2 correct entries
(iii) **Dinkey** with a valid reason, e.g. refers to the skew of the stem-and-leaf diagram, or compares the modes or medians	E1	Do not accept reason based on range Accept responses where means have been calculated and compared (59.9 & 64.9) Accept comparison of the totals (659 & 714) Do not accept 'On average, Dinkey', as a repeat of the question, however average 'Dinkey because their averages are higher'
(b)(i) 50 × 1.40 (=70) or 2.5 × 1.40 (=3.5) or 90÷1.40 (=64.2857…) or 4.5÷1.40 (=3.2142…) or equivalent	B1	
'Not correct' stated or implied with correct interpretation of their appropriate calculation	E1	Depends on B1 *Alternative:* *Sunday = 90 and Wednesday = 50 leading to either 90/50 or 40/50 B1* *which indicates 80% more sold on Sunday rather than 40% E1* Do not accept 100 × 50/90 = 55.55..% is incorrect, hence B0 'Wednesday sales 55.5…% of Friday sales', is incorrect, hence E0
(ii) Notices that the pictogram is number of cases not prices/costs	E1	Accept 'no' as implied within a suitable explanation
	9	

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Applications Unit 2 Foundation Tier June 2014	Mark	Comment
13. (a) Example, 'output is the measurement in km', or 'conversion to km'	E2	Must have engaged with change of units for E2. E1 for correct but vague responses, e.g. 'measurements are smaller', 'changing units', 'changing measurements' Allow E1 for 'change to metres' or for the idea that is involves conversion
(b) Correct flowchart with appropriate symbols Accept equivalent ways For example,  	B6	Ignore if start/stop 'rounded rectangle' missing. Accept shapes not drawn using a ruler. Mark as follows: B1 Shape of boxes –Decision boxes shown as rhombus, non-decision boxes as rectangle, input/output boxes shown as parallelograms B1 for including entry of a **whole number** B1 for correct use of **'is it odd?'** or equivalent question B1 **Yes/No** labelled to appropriate next step B1 for following on from odd numbers to '**add 1**' B1 Bringing back together **and** including 'output of even number' or 'output number' *Do not accept flowchart based on checking numerically only without being generic, although it may be possible to award B1, B0, B0, B1, B0, B0*
	8	

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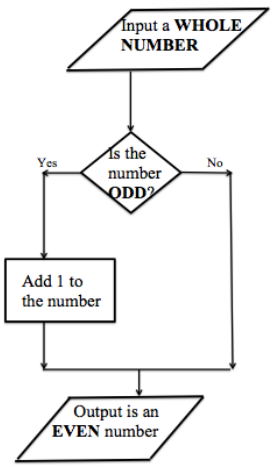
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UNIT 2 (HIGHER TIER)

Applications Unit 2 Higher Tier June 2014	Mark	Comment
1. 1 Pyramid Cubit — **25.027** inches, 3dp. 1 Pyramid Inch — **2.543** cm, 4 sig. fig.	B2 B2 4	B1 for sight of 25.0(2711688) rounded or truncated B1 for sight of 2.5(42755075008) rounded or truncated *If no marks SC1 for evidence of 25×1.001(08…) AND 2.54 × 1.001(08…)*
2(a)(i) (=) B2 + C2 or sum(B2:C2) or sum(B2,C2)	B1	Or equivalent through percentage
(ii) (=) 100 * B3/D3 or 100 * B3/(B3+C3) or equivalent correct alternatives	B2	B1 for sight of B3/D3 or through MR 100 * C3/D3 Accept × for *, and ÷ for /
(b) (Total carbohydrate in 360g pack is) 64.5 × 360÷100 (Number of bars found by) ÷15.48 (Number of bars) 15 (bars)	M1 M1 A1	Method may be shown in either order *Alternative method:* *(Weight of one bar is)* *15.48 × 100÷64.5 (=24g) M1* *(Number of bars)* *360 ÷24 M1 FT 'their 24'* *(Number of bars)* *15 (bars) A1*
Look for: • Calculations linked to text • Units given as appropriate, g or 'bars' • Spelling • Final statement QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps **AND** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(c) (Carbohydrate =) 85 × 64.5(0) ÷100 54.8 or 54.82 or 54.83 or 55 (g)	M1 A2 11	A1 for 54.825
3(a) All 7 points plotted correctly, not joined	B2	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined
(b) Reasonable straight line of best fit by eye, some points above and below	B1	Do not accept through intersection of the axes
(c) Positive	B1	Accept appropriate descriptions
(d)(i) Example of 'takings' ÷ 'number of visitors' or decision to **compare takings with number of visitors** Manager might think 'takings' ÷ 'number of visitors' is valid which always gives a result >£1, or comparison with **conclusion that takings is always greater than number of visitors**	B1 E1	
(ii) Explanation, e.g." 'takings' ÷ 'number of visitors' is not valid because **some visitors may not even visit the tea shop,** (so they spend £0, also some visitors may spend a lot less than £1 and other spending much more than £1)"	E1 7	Or states that 'takings' ÷ 'number of visitors' is not valid Accept 'some visitors may not spend anything in the tea shop', also accept a reason based on some people spending <£1 and some >£1.

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Applications Unit 2 Higher Tier June 2014	Mark	Comment
4(a)(i) 87 AND Subidas	B1	Do not accept indication on the diagram unless 87 seen
(ii)	B4	Median, mode and range correct, OR B3 for 4 or 5 correct entries B2 for 3 correct entries B1 for 1 or 2 correct entries
(iii) **Dinkey** with a valid reason, e.g. refers to the skew of the stem-and-leaf diagram, or compares the modes or medians	E1	Do not accept reason based on range Accept responses where means have been calculated and compared (59.9 & 64.9) Accept comparison of the totals (659 & 714) Do not accept 'On average, Dinkey', as a repeat of the question, however average 'Dinkey because their averages are higher'
(b)(i) 50 × 1.40 (=70) or 2.5 × 1.40 (=3.5) or 90÷1.40 (=64.2857…) or 4.5÷1.40 (=3.2142…) or equivalent	B1	
'<u>Not correct</u>' stated or implied with correct interpretation of their appropriate calculation	E1	Depends on B1 *Alternative:* *Sunday = 90 and Wednesday = 50 leading to either 90/50 or 40/50 B1* *which indicates 80% more sold on Sunday rather than 40% E1* Do not accept 100 × 50/90 = 55.55..% is incorrect, hence B0 'Wednesday sales 55.5…% of Friday sales', is incorrect, hence E0
(ii) Notices that the pictogram is number of cases not prices/costs	E1	Accept 'no' as implied within a suitable explanation
	9	
5(a) Example, 'output is the measurement in km', or 'conversion to km'	E2	Must have engaged with change of units for E2. E1 for correct but vague responses, e.g. 'measurements are smaller', 'changing units', 'changing measurements' Allow E1 for 'change to metres' or for the idea that is involves conversion
(b) Correct flowchart with appropriate symbols Accept equivalent ways For example,  	B6	<u>*Ignore if start/stop 'rounded rectangle' missing.*</u> Accept shapes not drawn using a ruler. <u>Mark as follows</u>: B1 Shape of boxes –Decision boxes shown as rhombus, non-decision boxes as rectangle, input/output boxes shown as parallelograms B1 for including entry of a **<u>whole</u> number** B1 for correct use of **'is it odd?'** or equivalent question B1 **Yes/No** labelled to appropriate next step B1 for following on from odd numbers to '**add 1**' B1 Bringing back together **and** including 'output of even number' or 'output number' *Do not accept flowchart based on checking numerically only without being generic, although it may be possible to award B1, B0, B0, B1, B0, B0*
	8	

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Applications Unit 2 Higher Tier June 2014	Mark	Comment
6(a)(… the) cost of a sandwich in pence AND (… the) cost of a drink in pence	B2	Do not accept 'sandwiches' and 'drinks' need 'cost'('price') and unit 'pence' B1 if correct (cost) but 'in pence' omitted, or for either statement correct, or for '*sandwiches in pence and drinks in pence'* B0 for 'sandwiches' and 'drinks'
(b) Method, e.g. equal coefficients Correct first variable Method to find 2nd variable, e.g. substitution Correct second variable	M1 A1 m1 A1	Allow 1 slip in non-equalised variable $x = 180$ or $y = 90$
(c) Idea that £1.68 is 112% Start of a correct method 1(.)68/1(.)12 (×100 ×10) 1 box costs (£)15	B1 M1 A1 9	For the division of correct digits, not place value An answer of (£)1.5(0) implies B1, M1, A0
7(a)(i) (diagonal base^2 =) $230^2 + 230^2$ diagonal base^2 = 105800 or diagonal base = $\sqrt{105800}$	M1 A1	diagonal base = 325.269…., ½ diagonal base = 162.63… or $115\sqrt{2}$
path^2 = (½ diagonal base)^2 + 146^2 path^2 = 47766 or path = $\sqrt{47766}$ Path 218.6 or 218.5(543…) (m)	M1 A1 A1	FT ½ their diagonal base, but not 230 or 115 Must be for correct ½ diagonal base used Accept 218 or 219 from correct working *Alternative for the 1st 3 marks:* *path² = 115² +115² +146²* *M3* *OR* *115² +115²* *OR 115² +146²* *M1* *= 26450* *OR* *= 34541* *A1* *path^2 = 26450 + 146^2 OR path^2 = 34541 + 115^2* *M1*
(ii) tan e = 146/ '½diagonal' or sin e = 146/path or cos e = '½diagonal'/path e = 41(.9…°) or 42(°)	M1 A2	FT throughout for their '½ diagonal' and their 'path' for M1 only CAO. A1 for e = $\tan^{-1}0.8977…$ or $\sin^{-1}0.668…$, or $\cos^{-1}0.744…$
(b) 7/15.4 = x/17.6 or x = 17.6 ÷ 2.2 or equivalent (side on smaller triangle x =) 8 (cm) y = 2.2 × 11 or y/11 = 15.4/7 or equivalent (side on larger triangle y =) 24(.2 cm)	M1 A1 M1 A1 12	For a correct first step For a correct first step
8(a) Line $d+p = 25$ drawn correctly Line $3d+2p= 60$ drawn correctly The correct region indicated	B1 B1 B1	FT their inequalities for similar region provided at least 1 line is correct
(b) Any correct point from the correct region, using whole numbers only	B1 4	FT from 2 lines with at least one line drawn correctly and similar region Do not accept *p*(lates) = 0
9. Considering (1 dollar =) 1÷ 1.29(= 0.7751938 euros) Considering(1 dollar =) 1 ÷ 1.61 (= £0.62111801…) Realising (£)1 ÷ 1.61 = 1÷ 1.29 (euros) ((£)1 = 1.61 × 1÷ 1.29 =) 1.24(8 euros) OR 1.25(euros)	B1 B1 M1 A1 4	Award B1, B1, M1 for sight of 1.61 ÷1.29
10. Π × 1.8^2 × 142/360 OR Π × 3.6^2 × 142/360 Π × 3.6^2 × 142/360 - Π × 1.8^2 × 142/360 Answer 12(cm^2) or answers in the range 12.03 to 12.05 (cm^2)	B1 M1 A1 3	Seen in working Or equivalent

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Applications Unit 2 Higher Tier June 2014	Mark	Comment
11(a) $5.2/100 \times 450$ or 0.052×450 or $23.4(0)$ $(1 + 0.052)^4 \times 450$	B1 M1	May be embedded in further calculation Method of adding on different amounts , 4 year period, following attempts to calculate 5.2% Example of working without truncation or rounding: *(450+23.4(0) =473.4(0)* *473.4(0) + 24.6168 = 498.0168, 498.01 or 498.02* *498.0168 + 25.8968736 = 523.9136736* *523.9136736 + 27.24351.. = 551.15718…)* *Accept 551.15(7….)* *B1 and SC1 for depreciation 363.45(099..), but no FT for a conclusion* *Simple interest answer of 543.6(0) is awarded only the B1*
(£) 551.16	A1	
Conclusion, e.g. 'Yes as more than £550'	E1	FT from their compounded amount provided M1, and FT from simple interest from an answer of 543.6(0) being < 550
(b)(i) 0.068 (ii) Greater AND a reason, e.g. 'interest is accumulated through the year (each three months)'	B1 E1	CAO
(iii) Use of $n = 4$ $(1 + 0.068/4)^4 - 1$ AER 6.98(%)	B1 M1 A2	Correct substitution in the formula given A1 for 0.06975373… rounded or truncated, or incorrect rounding or truncation of the AER percentage. Mark final answer (box takes priority)
(iv) Explanation, based on need for fair comparison of interest rates	E1 11	Allow 'percentage of interest paid annually', must mention 'year' or 'annual'
12(a)(i) All 5 plots accurate (taking into account accuracy difficulty of plotting) AND joined with a curve	B3	B2 for plots generally accurate for the first 2 seconds with an attempt at the others, but not joined by a curve (or joined by straight lines), OR B1 for (2500,) 1875, 1406.25, 1054.6(875), 791.0(15625) or (2500,) 1875, 1406, 1055 (or 1054), 791 (or 790) *SC1 for (2500) 625, 156.25, 39.0625, 9.76.. plotted AND joined with a curve*
(ii) From their graph	B1	
(b) $f = m \times 3^5/4^5$ or $f = 243m/1024$ or $f = m \times 0.75^5$ or $f = m \times 0.237304687$	B3 7	B2 for an expression, or $f = m/4^5$, $f = m/1024$, $f = m \times 0.25^5$, or $f = m \times 0.0009765625$, or equivalent OR B1 for evidence of m **repeatedly** being multiplied by: ¾, divided by 4 or multiplied by 0.75 or 0.25 i.e. more than once, OR sight of or 243/1024 or 0.237304687 or 1024 or 0.0009765625

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Applications Unit 2 Higher Tier June 2014	Mark	Comment
13(a)(i) $3000 \div 60$ $= 50$ l/min. or 50 litres per minute	M1 A1	 Units must be given for A1 Accept 50 bottles/min
(ii) 3000×12 or 36000 3.6×10^4	M1 A1	 If no marks SC1 for 7.2×10^4
(b)(i) Use of: Cylinder + hemisphere = $\pi r^2 h + \frac{2}{3}\pi r^3$ Use of 1 litre = 1000ml or 1litre = $1000cm^3$ Realising $1000 = \pi \times 4^2 \times h + \frac{2}{3} \times \pi \times 4^3$	B1 B1 S1	 Accept use of 1 instead of 1000, and 8 instead of 4. Mark for the idea of how h can be found, but may have errors in substitution.
$h = \frac{1000 - \frac{2}{3} \times \pi \times 4^3}{\pi \times 4^2}$	M1	For the isolation of h. Accept FT for equivalent level of difficulty, e.g. with 1 instead of 1000, 8 instead of 4. Not for accuracy, for isolation, which may be seen in parts.
Height of cylinder, 17.2 (cm) Answers in the range 17.2 to 17.24(cm)	A1	CAO. Accept 17.3 as rounding up is appropriate Only accept 17(cm) from correct working
Overall inside height 21.2(cm) or 21(cm)	B1	FT 'their 17.2' + 4 correctly evaluated provided at least B1, S1 and M1 awarded in (i)
(ii) Reason, e.g. 'may not be able to fill to the top', 'measurements may be at lower bounds', 'need an air gap at the top of the bottle'	E1 11	

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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**	

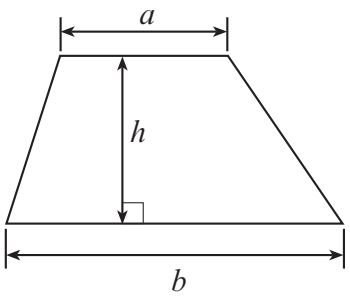
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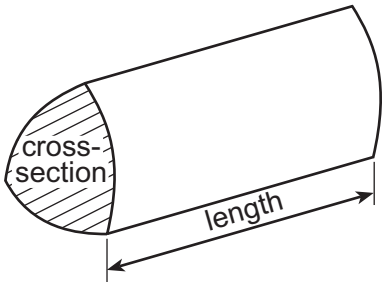
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Formula List

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

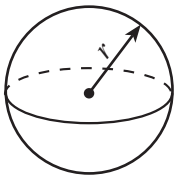


Volume of prism = area of cross-section × length



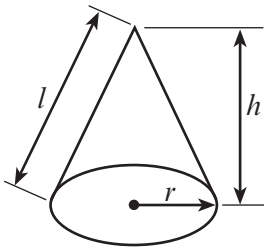
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

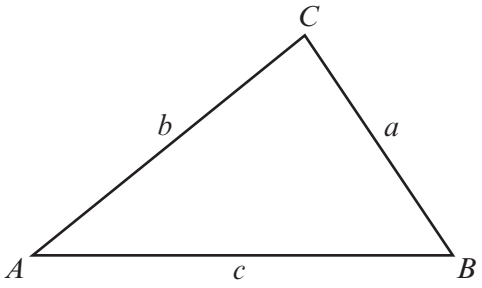


In any triangle ABC

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

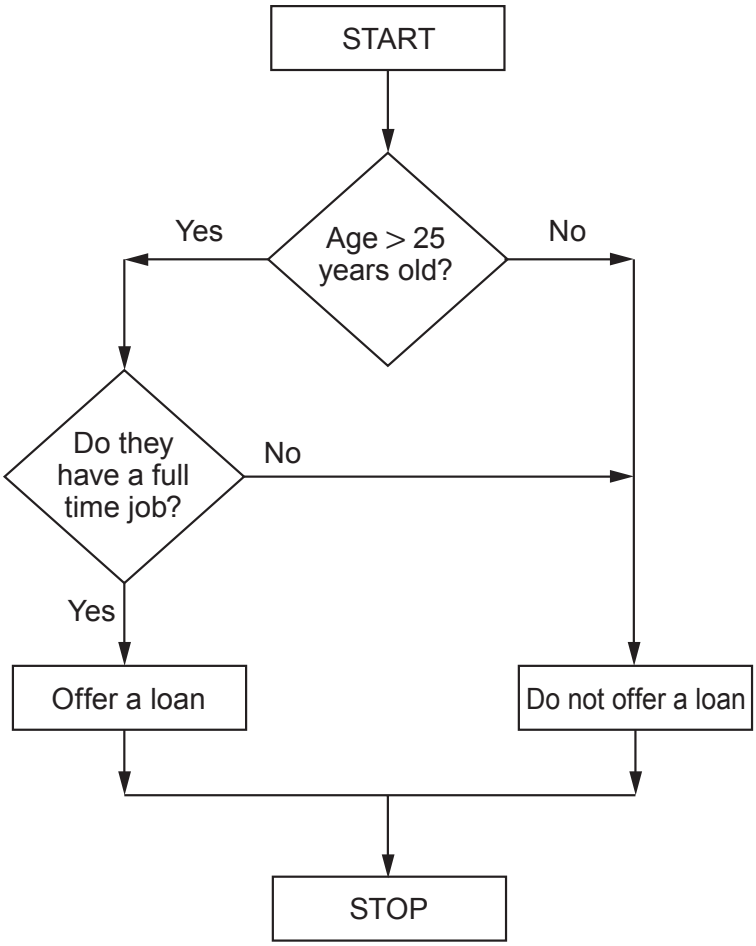
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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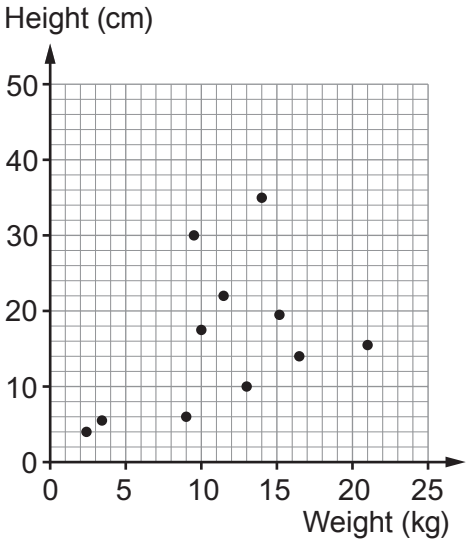
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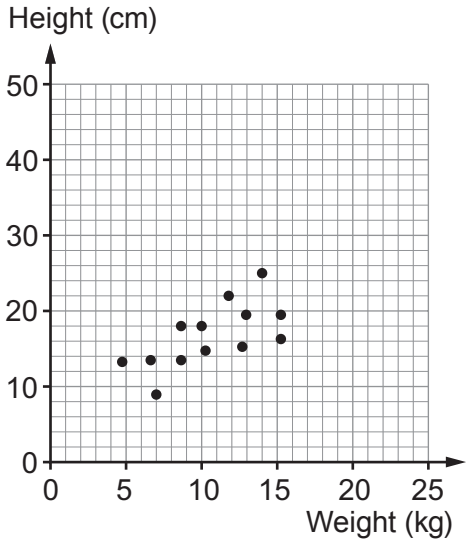
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3. Bethany and Michelle have both completed a project about pets.
They weighed and measured the heights of a number of pets.
They each drew a scatter diagram showing their results.

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]

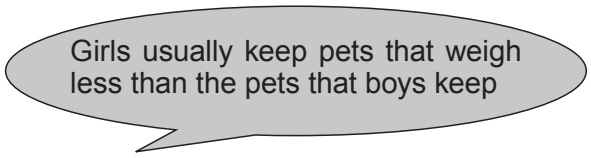
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(c) Carl also completed a project about pets.
He decided to weigh all his friends' pets.

Carl says



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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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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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]

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

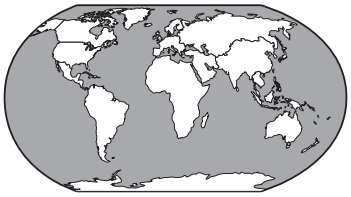
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6.

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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(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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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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(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]

(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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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]

(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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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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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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(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]

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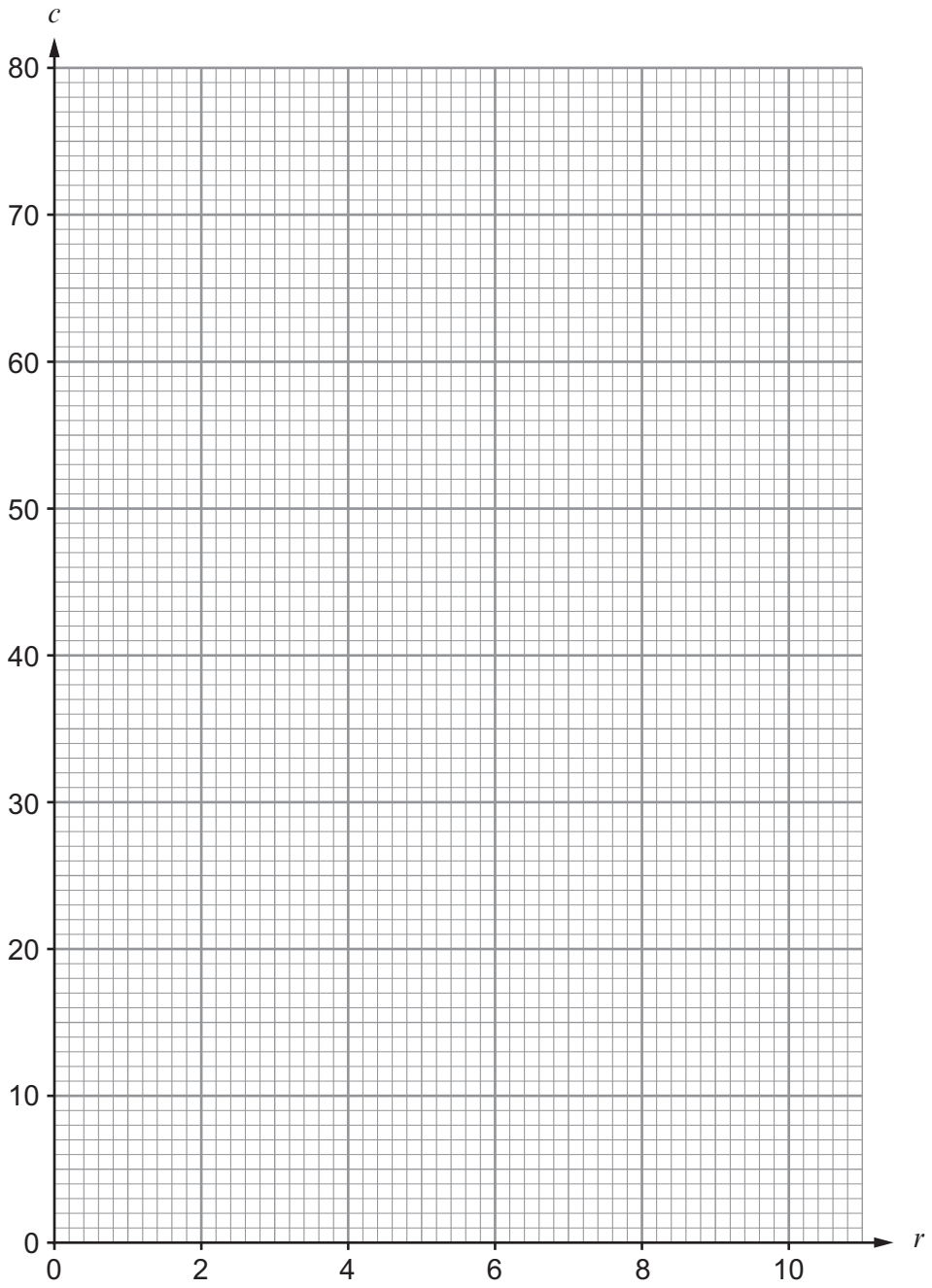
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(c) Thelma buys the maximum possible number of cushions, keeping to her conditions. Find the number of rugs and cushions she buys and the total cost. [2]

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Number of rugs = ...

Number of cushions = ...

Total cost = £ .....

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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.

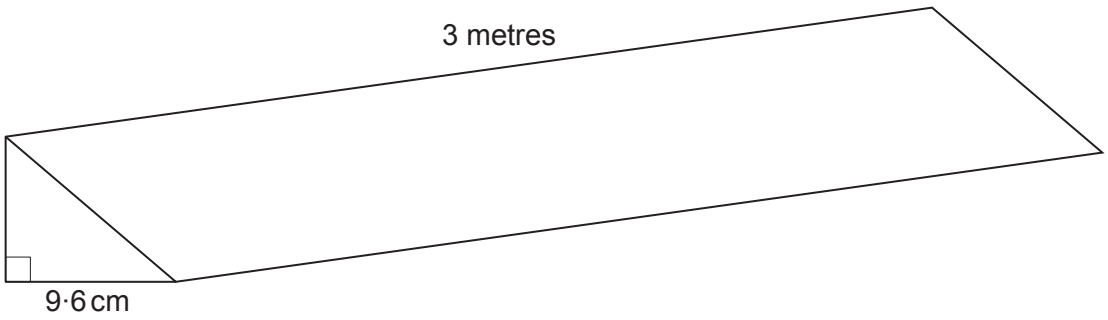


Diagram not drawn to scale

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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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.

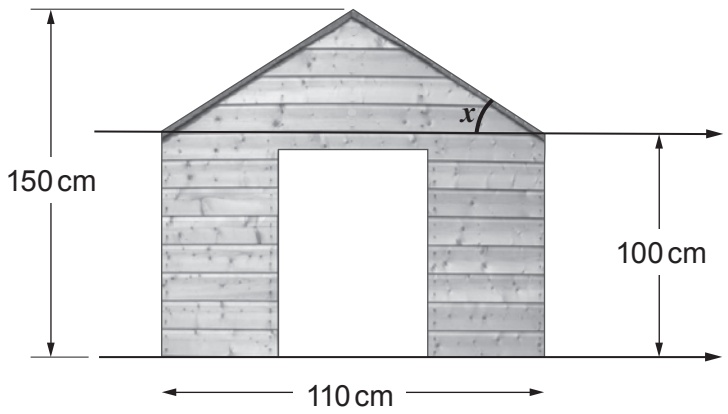


Diagram not drawn to scale

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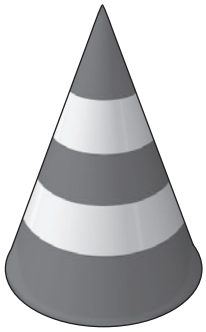
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14. A car dealer asks a company specialising in manufacturing metal artwork to make a hollow metal traffic cone.



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

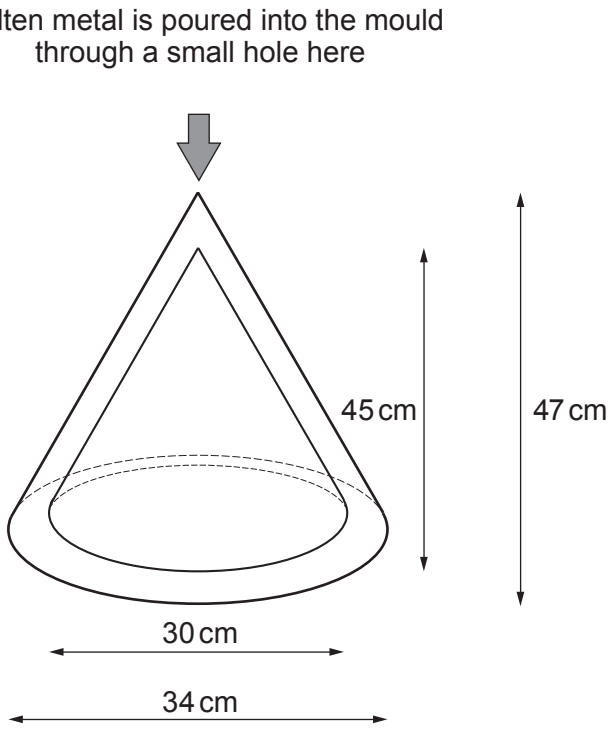


Diagram not drawn to scale

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.

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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

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

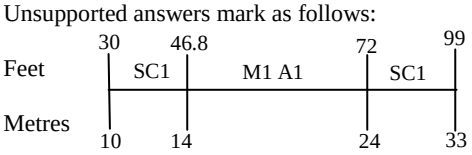
WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 2 Higher Tier	14

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APPLICATIONS UNIT 2
FOUNDATION TIER

Applications Unit 2 Foundation Tier January 2014	Mark	Comment
1. (a)(i) 18.36 79.95 81(.00) 201.8(0) (ii) $\frac{5}{100}$ × 'their 201.8(0)' (£)10.09 (iii) (£)191.71 (b) 66 + 121 + 102 + 67 356 (km) (c) Correct indication of Radius Arc (d) Labels on both axes Uniform scale on vertical axis All bars correct	B1 B1 B1 B1 M1 A1 B1 M1 A1 B1 B1 B1 M1 A1 14	 FT if no more than one error FT their total from(i) Accept rounded or truncated answers to 2dp from FT FT "their 201.8(0)" – "their 10.09" provided of equivalent difficulty CAO. Ignore incorrect units. Bars must have correct heights and equal widths
2. Door 6ft to 9ft OR 1.8m to 3m Door 1.5 (cm) train 11.7 - 12 (cm) (±2mm) Multiplying factor = 7.5 - 8 Length of train = Door's estimate × their SF (5 to 11) *= correct answer for their figures* Award SC1 for answers which: • only give door's height as 1.5cm **and** length of train between 11.7 and 12 cm (±2mm) **OR** • a proper attempt at 'dividing' the length of the train into equal parts.	B1 B1 M1 A1 4	 FT their door's estimate AND scale factors 5 to 11 inc For this A1 we need correct units (feet or metres) either explicitly shown or implied by their figures. Unsupported answers mark as follows: 
3. (a) (b) Science	B3 B1 4	Award B1 for each correct answer FT their completed table of percentages in (a)
4. (a) $x + 15 = 21$ (x =) 6 (b) $3y = 27$ (y =) 9	B1 B1 B1 B1 4	Accept $15 + x = 21$ or $21 = 15 + x$ or $21 - 15 = x$ or equivalent but not $x = 6$ Accept embedded answers for this B1. Accept $3 \times y = 27$ or $y \times 3 = 27$ or $y = 27/3$ but not $y = 9$ Accept embedded answers for this B1

Subject	Result as a %
Mathematics	74(%)
Welsh	**70(%)**
Science	**75(%)**
English	**67(%)**

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Applications Unit 2 Foundation Tier January 2014	Mark	Comment
5.(a) 700 × 11 = 7700 (kr) Left 1506 (kr) 1506 ÷ 11 = (£)136.91	M1 A1 B1 M1 A2	 FT "their 7700" FT "their 1506" provided not 6194 Award A1 for (£)136.90(9090…) or (£)137 *Alternative marksheme* *6194 ÷ 11 M1* *= (£)563.09 A2 Award A1 for 563.0909….* *700 – 563.09 M1* *(£)136.91 A2* *Award A1 if answer not to nearest penny*
(b)(i) (Thursday) -2 (°C) (ii) Saturday (iii) 10(°C)	B1 B1 B1 9	 Do not accept -9 Accept -10. FT from their Thursday temperature if lowest or highest.
6. (a) (Type A =) (£)50 + 12 × (£)34.99 = (£)469.88 (Type B =) (12 × (£)39 =) (£)468 (Type C =) (£)30 + 3 × (£)30 + 9 × (£)37.99 = (£)461.91 (Cheapest =) type D Suitable explanation e.g " She could get injured and would lose all the money if she doesn't go" "a lot of money to lose if she doesn't enjoy it or doesn't go regularly" "easier to pay in instalments" " a lot of money in one go" " she has to pay £449 in one payment" etc Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ being appropriate) Notes: QWC2 requires words throughout the response not just connected to the final answer. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 B1 M1 A1 B1 E1 QWC 2	 FT their calculations FT provided a suitable explanation given QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b) Correct diagram	B2	B1 for complete shape with only 1 incorrect vertex or for sight of all correct vertices (may be joined incorrectly or not joined at all)
(c) 4 or 5 angles correct and correctly labelled. 4 or 5 angles correct, labels not fully correct. 2 or 3 angles correct and correctly labelled. 2 or 3 angles correct, labels not fully correct. 1 angle correct and correctly labelled.	B4 OR (B3) (B3) (B2) (B1)	Use the correct overlay and allow ±2°. Correct labels (Words NOT the frequency OR angle) 4 correct labels are enough. If only B1 is scored for the diagram and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks.

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Applications Unit 2 Foundation Tier January 2014	Mark	Comment
OR If 0 OR 1 for their diagram or no diagram. 360/240 Angles are 93, 84, 57, 45, 81. (d) For intention to divide all dimensions by 5 4, 3 & 6 4 × 3 × 6 72	 (M1) (A1) M2 A1 M1 A1 20	If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 1.5° gets the M1 OR SC1 for all the correct percentages 25.8%, 23.3%, 15.8%, 12.5%, 22.5% M1 for intention to divide 1 or 2 of the dimensions by 5 FT their 4, 3 & 6 provided at least two of 4, 3 & 6 are correct *Alternative method* *Volume of box* 5^3 *OR Volume of container* $20 \times 15 \times 30$ *M1* $125\ (cm^3)$ *A1* $9000\ (cm^3)$ *A1* *Number of boxes* $9000 \div 125$ *M1** $= 72$ *A1* ** FT provided at least one of the volumes is correct*
7. Indicates: Mr Roberts, Miss Evans, Miss Abbott, Mr Brett	B2 2	Accept any unambiguous indication B1 for at least 3 correct and no more than 1 incorrect
8. (a) Use of ×48÷4 or ×12 OR realising 55g is 2oz (12 × 55) ÷110 × 4 OR 2 × 12 OR equivalent correct calculation 24 (ounces) (b) 150 fl oz = 150 × 25 (ml) (=3750 ml) 1 pancake 37.5/4 (= 9.375) ml water OR notices 3750 is 100 × amount given in the recipe (3750/9.375 OR 100 × 4 =) 400 (pancakes)	B1 M1 A1 M1 M1 A1 6	(2 oz for 4 pancakes, so 2 × 12) OR 3750÷37.5 = 100
9. (a) Choice and reason, e.g. 'Michelle because of correlation', 'Michelle because no very short animals' (b) Line of best fit on Michelle's scatter diagram (c) Statement, e.g. 'Carl **not** correct as both the mode and the median are greater for girls' pets', 'Carl not correct as the mode for girls is greater and the range is not helpful'	E1 B1 B3 E1 6	Accept 'all close together' Appropriate direction with some points above and below the straight line B2 for 4 or 5 correct B1 for 2 or 3 correct *Ignore any extra calculations of the means.* Accept statement which includes the means Depends on previous award of at least B2 Statement must include reference to mode, or median (and range) Accept 'Carl is not correct as the girls' mode is higher', 'Carl is not correct as the girls' median is higher' Accept 'Carl is correct as the range is greater and the medians are similar', must refer to median **and** range

	Mode	Median	Range
Boys' pets	(0)2	15	40
Girls' pets	29	18	25

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Applications Unit 2 Foundation Tier January 2014	Mark	Comment
10.(a)(i)		Throughout (a) at least 3 response groups or response options are needed as appropriate, any given groups must not overlap or have gaps
Age: Use of non-overlapping groups and no gaps in groups for ages	B1	
Number of holidays: Use of non-overlapping groups and no gaps in groups given, or list of numbers to indicate (need not start at 0)	B1	
Number of days: Use of non-overlapping groups and no gaps in groups not exceeding 365 days	B1	
Type of holiday: List some types (perhaps with option for others), e.g. beach, city break, camping, activity, ..	B1	
(ii) Reason, e.g. 'helps summarise', or 'smaller number of categories to manage', or 'can't list them all'	E1	
(b) (Value of insurance sales =) 6000 × 0.8 × 130	M1	
(£) 624000	A1	
(Number of customers claiming =)	M1	
6000×0.8×0.3(=1440)	B1	Must be a single value
(Typical claim taken as £)450	m1	FT 'their 450' between 400 and 500 inclusive
(Amount paid out in claims 1440 ×450 = £) 648000	B1	Do not accept 24000
Loss and (£)24000 or –(£)24000		FT provided M1, M1, m1 awarded Use of 400 gives 48000 profit, 500 gives 96000 loss, the final 3 marks are then B0, m1, B1 *If 400 & 500 (or 2 other extreme amounts)both considered and then summarised, with equivalent working then all of the final 3 marks may be awarded.*
	11	

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APPLICATIONS UNIT 2
HIGHER TIER

Applications Unit 2 Higher Tier January 2014	Mark	Comment
1. Indicates: Mr Roberts, Miss Evans, Miss Abbott, Mr Brett	B2 2	Accept any unambiguous indication B1 for at least 3 correct and no more than 1 incorrect
2(a)(i) Suitable explanation demonstrating knowledge that the size must be increased to be identical (ii) Suitable explanation demonstrating knowledge that similar means same shape / angles, e.g. 'not the same shape', 'one is in italics' (b) States, e.g. 'turn around through half turn', 'turn upside down' (c) Use of either 5/7 or 7/8 5/7×7/8 5/8 (=35/56) or equivalent	E1 E1 E2 B1 M1 A1 7	e.g. ' double the size', 'enlarge' Do not accept if response implies that they must be the same size Accept 'Rotation (through) 180°' E1 for either turn / rotation or half turn / 180° Do not accept 'flipped' unless 2 appropriate stages are described Accept 0.625 Mark final answer If no marks, SC1 for (2/7 × 1/8 =) 2/56 or in decimals *Alternative:* *1 – (2/7 + 5/7 × 1/8) B1, M1*
3(a) Choice and reason, e.g. 'Michelle because of correlation', 'Michelle because no very short animals' (b) Line of best fit on Michelle's scatter diagram (c) Statement, e.g. 'Carl **not** correct as both the mode and the median are greater for girls' pets', 'Carl not correct as the mode for girls is greater and the range is not helpful'	E1 B1 B3 E1 6	Accept 'all close together' Appropriate direction with some points above and below the straight line B2 for 4 or 5 correct B1 for 2 or 3 correct *Ignore any extra calculations of the means.* Accept statement which includes the means Depends on previous award of at least B2 Statement must include reference to mode, or median (and range) Accept , for example 'Carl is not correct as the girls' mode is higher' Accept 'Carl is correct as the range is greater and the medians are similar', must refer to median **and** range
4(a) Use of ×48÷4 or ×12 OR realising 55g is 2oz (12 × 55) ÷110 × 4 OR 2 × 12 OR equivalent correct calculation 24 (ounces) (b) 150 fl oz = 150 × 25 (ml) (=3750 ml) 1 pancake 37.5/4 (= 9.375) ml water OR notices 3750 is 100 × amount given in the recipe (3750/9.375 OR 100 × 4 =) 400 (pancakes)	B1 M1 A1 M1 M1 A1 6	(2 oz for 4 pancakes, so 2 × 12) OR 3750÷37.5 = 100
5(a) 1220.18 ÷ 1.69 (= 722 (litres)) AND ÷ 4.55 (= 158.681319… (gallons)) AND × 42.9 6810 (miles) (b)Appropriate use of either 1 litre = $1000cm^3$ or $1m^3 = 1000000cm^3$ or $1m^3 = 1000$litres or similar 80 × 1000 ÷ 1000000 or 80 ÷ 1000 or equivalent 0.08 (m^3)	M3 A2 B1 M1 A1 8	Complete method ((1220.18÷1.69)÷4.55)×42.9 M2 for any 2 of the 3 operations suitable, other omitted or incorrect, OR M1 for 1220.18÷1.69, or 42.9÷4.55, or 4.55÷42.9, or 1.69×4.55 A marks depend on M3 A1 for 6807(.42857… miles) or correct from premature approximation

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Applications Unit 2 Higher Tier January 2014	Mark	Comment
6(a)(i) Age: Use of non-overlapping groups and no gaps in groups for ages Number of holidays: Use of non-overlapping groups and no gaps in groups given, or list of numbers to indicate (need not start at 0) Number of days: Use of non-overlapping groups and no gaps in groups not exceeding 365 days Type of holiday: List some types (perhaps with option for others), e.g. beach, city break, camping, activity, .. (ii) Reason, e.g. 'helps summarise', or 'smaller number of categories to manage', or 'can't list them all'	 B1 B1 B1 B1 E1	Throughout (a) at least 3 response groups or response options are needed as appropriate, any given groups must not overlap or have gaps
(b) (Value of insurance sales =) 6000 × 0.8 × 130 (£) 624000 (Number of customers claiming =) 6000×0.8×0.3(=1440) (Typical claim taken as £)450 (Amount paid out in claims 1440 ×450 = £) 648000 Loss and (£)24000 or –(£)24000 Look for • spelling • clarity of text explanations and/or labels • the use of notation (watch for the use of '=', £, % being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 B1 m1 B1 QWC 2 13	Must be a single value FT 'their 450' between 400 and 500 inclusive Do not accept 24000 FT provided M1, M1, m1 awarded Use of 400 gives 48000 profit, 500 gives 96000 loss, the final 3 marks are then B0, m1, B1 *If 400 & 500 (or 2 other extreme amounts)both considered and then summarised, with equivalent working then all of the final 3 marks may be awarded.* QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

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Applications Unit 2 Higher Tier January 2014	Mark	Comment
7(a) 19225/(34400+3100) OR 12540/(26850+2760) 19225/(34400+3100) × 100 AND 12540/(26850+2760) × 100 June stated or implied AND With sight of 51(.2666… %) AND 42(.35… %) (b) $50000 – 3.2 \times 10^4$ or equivalent 1.8×10^4 (c) 24.3(0)×100/135 or 24.3(0)÷1.35 (£)18 (d) $1.7\times10^4 + 1.7\times10^4\times2$ $+ 1.7\times10^4\times2\times2 +$ $1.7\times10^4\times2\times2\times2$ Or equivalent (£) 2.55 $\times10^5$	M1 m1 A1 M1 A2 M1 A1 B2 B2 12	 A1 for 18000 OR $15 \times 1.7 \times 10^4$ B1 for sight of $1.7\times10^4\times2\times2\times2$ or equivalent for the 4th month B1 for 255000 or 25.5×10^4 or 2.5×10^5 from correct working
8(a) P = ns (b) Correct set up for eliminating one variable First variable's value Method to find second variable, FT from their first value Second variable's value	B1 M1 A1 m1 A1 5	Accept P = s×n Allow 1 error in the non equated variable g = 2 and h = 1/2 Award all 4 marks for unsupported correct answers
9.Sight of 305 (litres) Sight of 59.5 (seconds) 305/59.5 5.126 (litres/second)	B1 B1 M1 A1 4	 FT for their max litres (>300) / min time (<60) not 300/60 **Must be rounded to 3dp**

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Applications Unit 2 Higher Tier January 2014	Mark	Comment
10(a) Explains that 'interest is compounded'	E1	
(b)(i) (4.8 ÷ 12 =) 0.4%	B1	
(ii) 200×1.003^5	M1	
(£)203.02 or (£)203.01	A2	A1 for (£)203.01805… or 203 from compound working *Alternative method* *B1 for a correct 0.3% but not 3%* *M1 For the overall method (5 stages of adding different 0.3%).* *Accept inappropriate rounding or truncation for M1only, A0* *(Calculation:* *200* *0.60* *200.60* *0.60(18)* *201.20(18)* *0.60(36054)* *201.805405* *0.60541622* *202.410821* *0.60723246* *203.018053)* Do not ignore subsequent working, penalise -1 If no marks, then SC1 for Simple Interest (£)203.00
(iii)(F3=) (1 + D2 ÷ 100) × B2 or B2 × D2 ÷ 100 + B2 or equivalent	B2	Accept / for division , * for multiplication and ^ for index B1 for evidence of D2÷100, or D2×B2, or 1.012×B2, or 1.012×400 or equivalent B0 for 404.8(0)
(F14=) $(1 + D2 \div 100)^{12} \times B2$ or equivalent	B2	Accept cell E14 for indication of '12'. B1 for sight of power 12 linked to cell D2, or for $(1 + D2 \div 100)^x \times B2$, or (1+D2/100)^12*B2, or (1+D2/100)^E14*B2, or equivalent
	9	or for their formula for F3 with appropriate index provided equivalent difficulty
11(a) r ≥ 5 and c < 2r and 30r + 4c ≤ 300	B4	B3 for any 2 correct inequalities B2 for any 1 correct inequality with at least one other inequality only inaccurate due to incorrect symbol (>, ≥, <, ≤) B1 for any 1 correct inequality, **or** B1 for at least two inequalities only inaccurate due to incorrect symbol (>, ≥, <, ≤)
(b) Line r = 5 drawn correctly	B1	
Line c = 2r drawn correctly	B1	FT their inequalities if possible
Line 30r + 4c = 300 drawn correctly	B1	
The region indicated	B1	CAO
(c) 8 rugs and 15 cushions (giving 8×30 + 15×4)	M1	
(£)300	A1	FT their graph provided at least B2 in (b) 300 alone, without the number of rugs and cushions is M0, A0
	10	

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Applications Unit 2 Higher Tier January 2014	Mark	Comment
12. 5400 = ½ × 9.6 × … × 3(00) …. = (5400 × 2) ÷ (9.6 × 3(00)) or equivalent 3.75 (cm) hypotenuse^2 = 9.6^2 + 3.75^2 hypotenuse = √106.2(225) 10.3(… cm) Confirmation note completed: (9.6 cm), 3.8 (cm), 10.3(cm) and 300(.0 cm)	M1 M1 A1 M1 A1 A1 B1 7	Accept with 3 or 300 Rearrangement Accept 3.7, 3.8 or 4 FT from correct working FT 'their 3.75' provided at least M1 previously awarded Use of 3.7, 3.8, 4 gives 105.85, 106.6, 108.16 Use of 3.7, 3.8, 4 gives 10.288…, 10.32…, 10.4 FT provided all M marks awarded Accept 10.4 instead of 10.3 if FT from appropriate working. *N.B. Confirmation note must be completed for this B1, do not accept seen in working* *If no marks, SC1 for use of their height correctly within Pythagoras' Theorem*
13. Form and use a right angled triangle with base 55cm and height 50 cm Tan x = 50/55 42(°) or 42.3(°)	S1 M1 A3 5	 Or alternative FULL method A2 for 42.27….(°) A1 for tan^{-1} 0.909… or tan^{-1} (50/55)
14. Volume = volume outer cone– volume inner cone = 1/3 × π × 17^2 × 47 - 1/3 × π × 15^2 × 45 3.62 (litres)	S1 M2 A3 6	Accept for their incorrect volumes, but must come from 3D substitution M1 for 1/3 × π × 34^2 × 47 - 1/3 × π × 30^2 × 45 A2 for 3.619… (litres), 3.622…(litres), 3620 (cm^3) or FT from M1 to 14.5 (litres) A1 for answers between 3619 (cm^3) and 3622.7 (cm^3) inclusive or FT from M1 to 14.48(litres), 14.49(litres) or 14500(cm^3) *If no marks, SC1 for both volume expressions or use of 16 and 46 as appropriate within one volume expression*

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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, 20 June 2013

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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 **5***(a)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**3**	
3	**4**	
4	**5**	
5	**11**	
6	**4**	
7	**4**	
8	**15**	
9	**2**	
10	**7**	
11	**6**	
12	**11**	
13	**2**	
14	**7**	
15	**4**	
16	**10**	
TOTAL MARK		

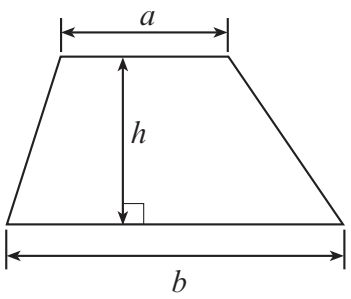
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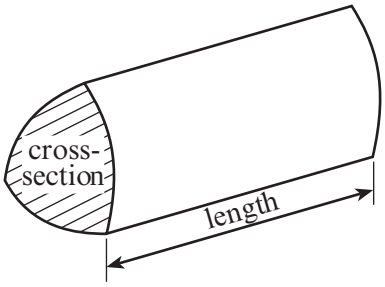
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Formula List

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

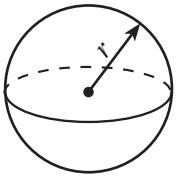


Volume of prism = area of cross-section × length



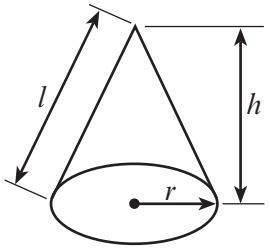
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

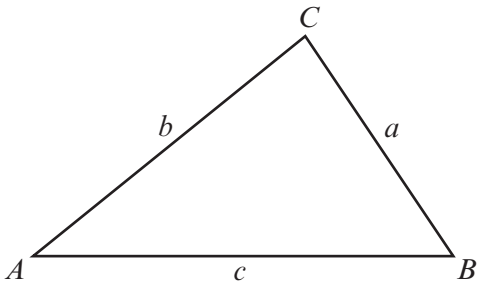


In any triangle ABC

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

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

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1. A furniture shop keeps a simple spreadsheet to show cost price, selling price and profit for sofas sold.

A section of this spreadsheet, with some entries missing, is shown below.

	A	B	C	D	E	F	G
1	Sofa	Cost price	Selling price	Profit per sofa	Number of sofas sold	Total profit	
2	Brown leather	£780	£999		5		
3	Cream cloth	£660	£1108.80		8		
4	Red velour	£500	£1000	£500	10		
5							

(a) Write down a formula that could be used in the spreadsheet, to calculate the entries for the following cells.

D3

.....

.....

F3

.....

.....

[3]

(b) (i) Complete this section of the spreadsheet by calculating the values of the missing entries in columns **D** and **F**.

.....

.....

[1]

(ii) Write down a formula, for cell **G5**, that could be used to calculate the total profit for the sales of **all** the sofas shown in this spreadsheet.

.....

[1]

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Examiner only

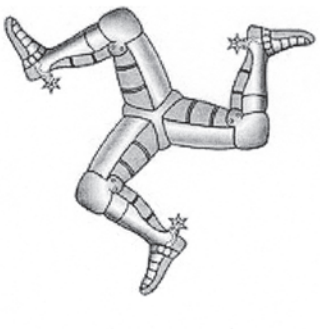
2. A plate manufacturer wishes to design a pattern to be printed on a new circular dinner plate. They consider three possible designs as shown below.



Rings



Petals



Legs

The new design must satisfy the following criteria.

Given that

n = the number of lines of symmetry

r = the order of rotational symmetry

then $n > 2$ and $r - n = 0$

Complete the following table.

Design	n	r	Satisfies the criteria? Yes or No
Rings			
Petals			
Legs			

.....

.....

.....

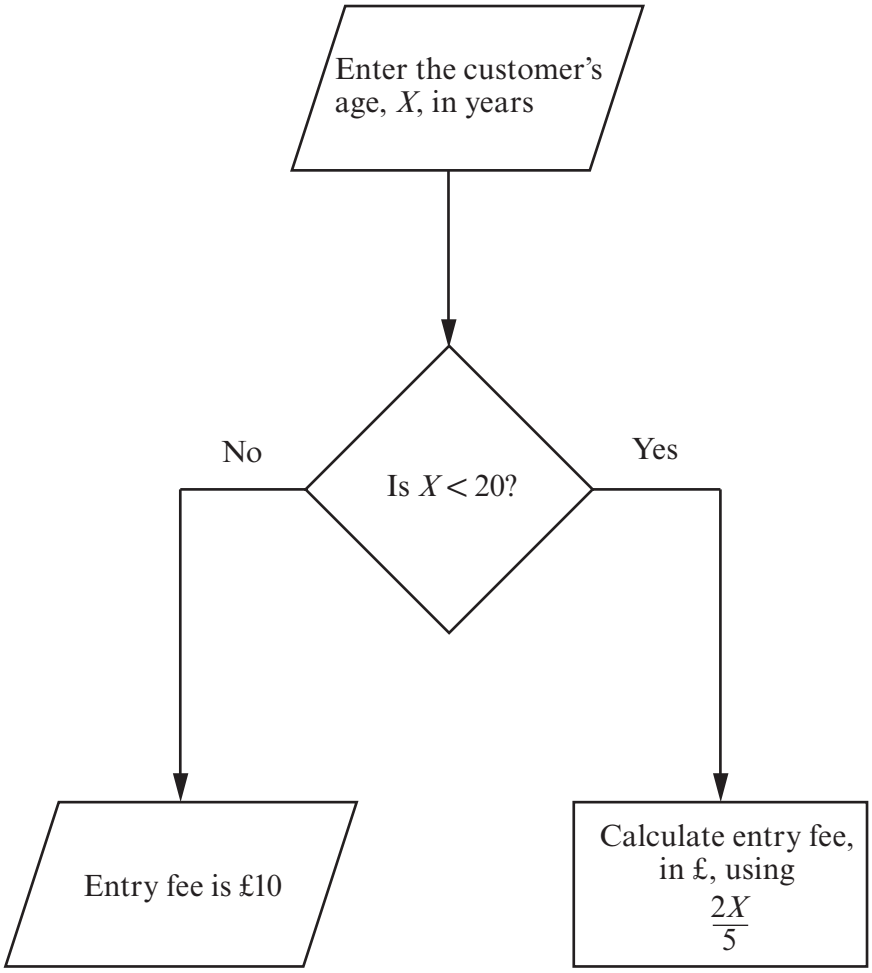
[3]

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3. The following section of a flowchart is used to find the entry fee for an Aqua Park.



Use this section of the flowchart to find the Aqua Park entry fee for each of the following customers.

Howard, aged 20

.....

.....

Betty, aged 10

.....

.....

Charlie, aged 6

.....

.....

[4]

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Turn over.

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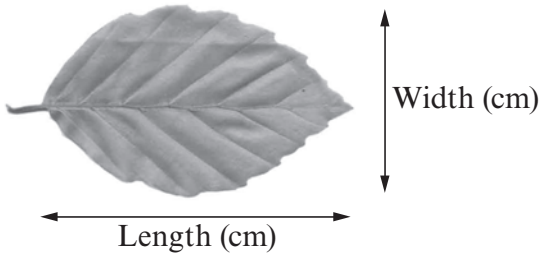
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Examiner only

4. Billy and Shaun both completed a survey.
They collected leaves from a number of trees and decided to measure them.

They agreed on the following decisions.

- The length of the leaf does not include the stem.
- The width of the leaf is measured at the widest section of the leaf.



(a) Why have they both agreed on these decisions about measuring the leaves?

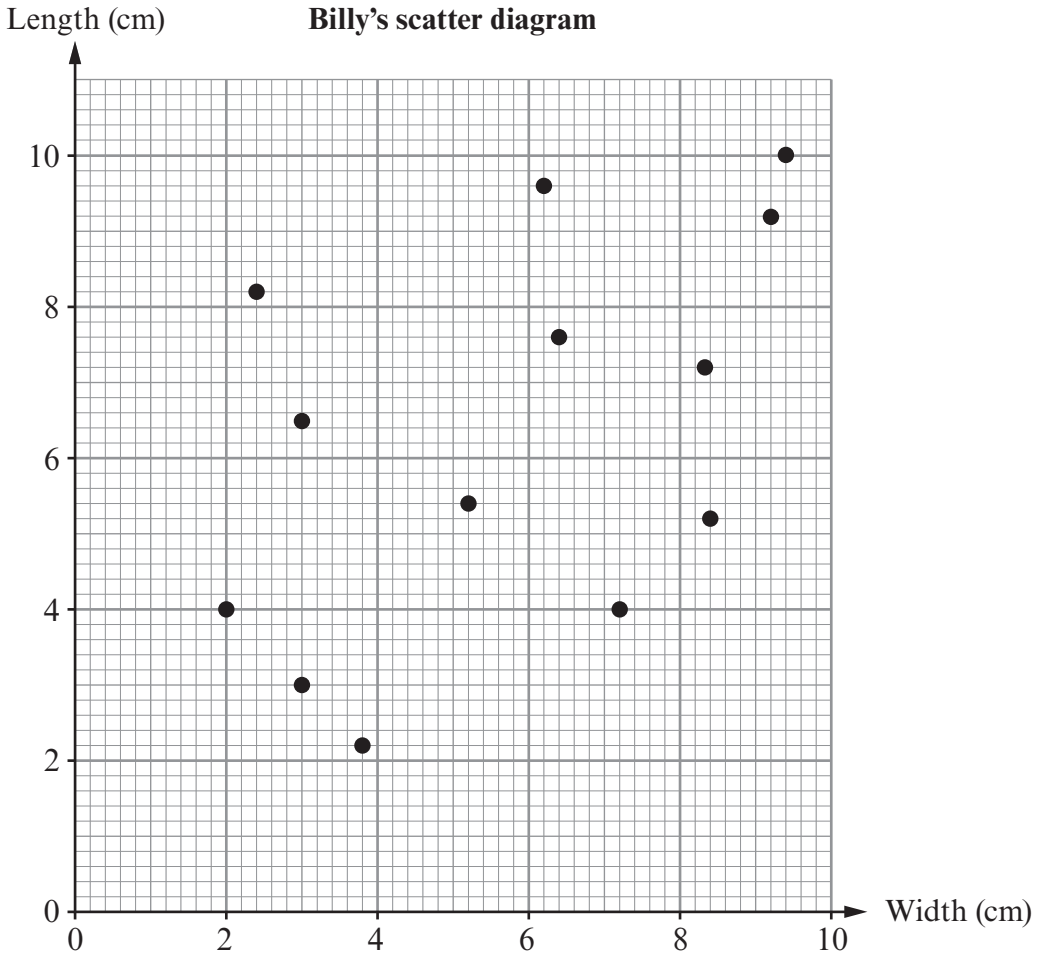
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[1]

(b) Billy measured the length and width of each leaf he had collected.
Shaun did the same with his leaves.
They displayed the lengths and widths of their own leaves on separate scatter diagrams.
Billy's scatter diagram is shown below and Shaun's scatter diagram is shown opposite.

Billy's scatter diagram

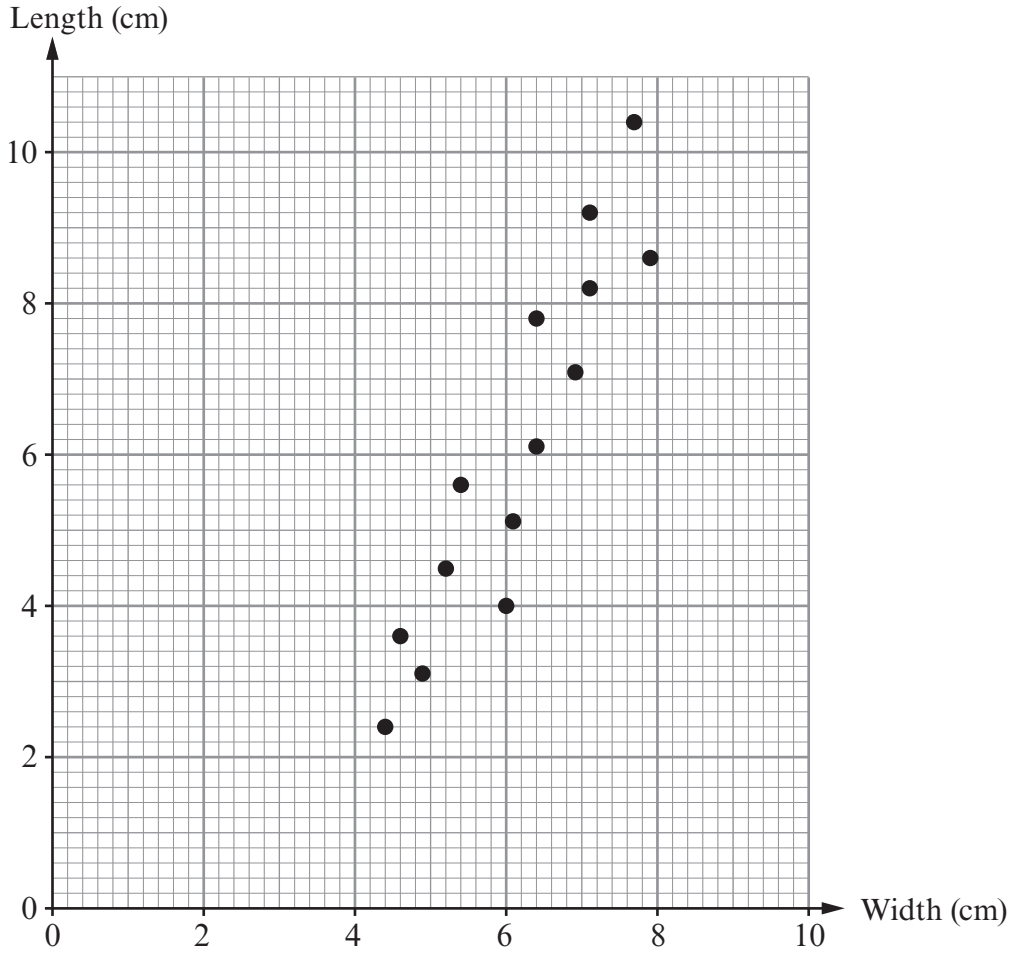


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Shaun's scatter diagram



(i) Who found the longest leaf? .....

Write down the length of this leaf. ..... cm [1]

(ii) One of the two boys collected leaves from a variety of trees.
Who was this, Billy or Shaun? Give a reason for your answer.

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[1]

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

(iv) Shaun realises he has one more leaf that he has not included on his scatter diagram.
The leaf is damaged in such a way that Shaun cannot measure its width.
The leaf is of length 8·5 cm.
Write down a reasonable estimate for the width of this leaf.

Width ..... cm

[1]

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5. Laura has her own car.

During April

- Laura drove a total distance of 560 miles in her car.
- Her car's fuel consumption was 37·8 mpg (miles per gallon).
- Petrol cost £1.48 per litre.

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

Given that 1 gallon is approximately 4·55 litres, calculate the cost of the petrol that Laura used during April.
You must show all your working.

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[7]

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(b) (i) Laura spent 10 hours 45 minutes driving during April.
Calculate the average speed of Laura's car for the distance driven during April.
Give your answer in miles per hour.

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[3]

(ii) Select which of the following best describes the roads on which Laura travelled during April.

You must give a reason for your answer.

A: Mainly small narrow country lanes
B: Mainly inner city roads with lots of traffic lights
C: Mainly motorways and dual carriageways
D: Mainly steep mountain routes with many sharp bends
E: Mainly roads with speed limits of 30 mph

Reason:

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[1]

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6. *Kingham Inc* is a company that makes cardboard boxes.
One of their boxes, in the shape of a triangular prism, is shown below.

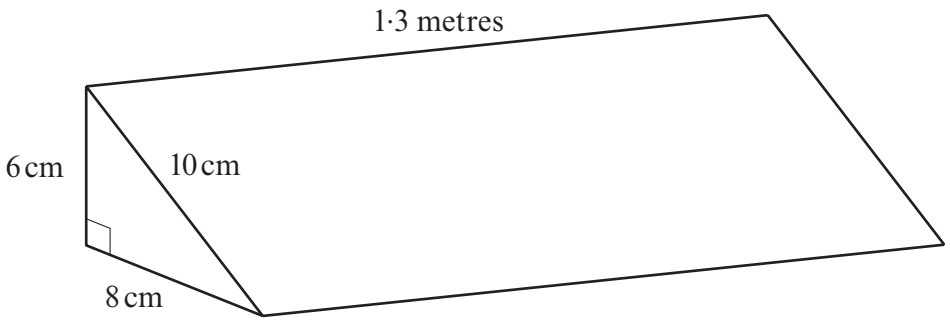


Diagram not drawn to scale

A customer asks if the box has a volume of 3 litres.

(a) Calculate the volume of the box in cm^3.

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[3]

(b) Is the volume of the box greater or less than 3 litres?
State by how much it is greater or less than 3 litres, giving your answer in cm^3.

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[1]

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7. *Abbiford Computers* sells computer systems.
Their customers are Internet businesses and town centre shops.
All customers are given access to a helpline when they are setting up a new computer system.
Abbiford Computers carried out a survey to find the number of times each customer called the helpline.
The stem-and-leaf diagram shows the results of the survey.

Internet businesses		Town centre shops
1	4	
	3	
3	2	2 3 5 7
5 3	1	1 4 4 6 8
7 4 3 3 2 2 2	0	7 9

Key: Internet businesses 3 | 2 means 23 calls
Town centre shops 1 | 8 means 18 calls

(a) Complete the following table.

	Median	Range	Mode
Internet businesses			
Town centre shops			

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[3]

(b) The director of *Abbiford Computers* states to the helpline manager,

"41 calls is not good enough. We need to provide better help for the Internet businesses buying computer systems from us."

How do you think the helpline manager should respond to the Director's statement?

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[1]

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8. Two chefs, Osian and Robyn, buy ingredients to make carrot and swede soup.





(a) Osian pays £2.19 in total for his soup ingredients.
He makes 14 portions of soup from his ingredients.
He charges £2.95 for a portion of soup.
There are other costs in making soup, including electricity and rent.
These other costs work out to be 12p per portion of soup made.

Calculate the percentage profit Osian will make if he sells 9 bowls of soup, the other 5 bowls of soup being wasted.

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[6]

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(b) Robyn sells her soup in cartons.
The height of one carton is 13·4 cm.

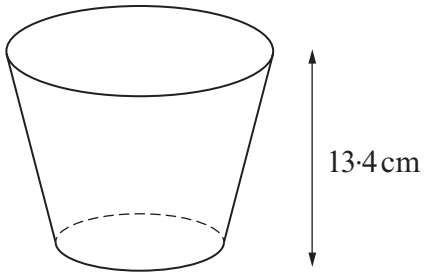


Diagram not drawn to scale

A stack of 4 empty cartons is shown below.

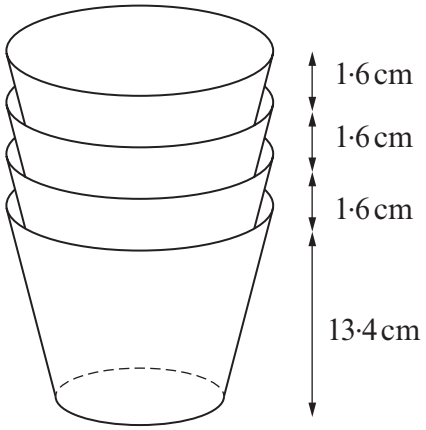


Diagram not drawn to scale

The height of a stack of x cartons is 35·8 cm.
Form an equation and solve it to calculate the number of soup cartons in the stack.

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[3]

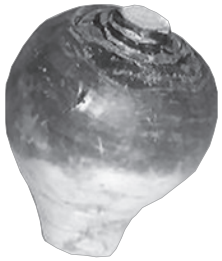
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(c) Each of the chefs uses their own special soup recipe.
On a different day, they both buy the same variety of carrots and swede from the same market stall.





Osian buys 2 kg of carrots and 4·5 kg of swede.
It costs him £3.69 to buy these ingredients.
Robyn buys 5 kg of carrots and 7·5 kg of swede.
It costs her £6.90 to buy these ingredients.

Use an algebraic method to calculate the cost of 1 kg of carrots and the cost of 1 kg of swede.

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[6]

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9. Mr Read and his daughter Jade each decide to buy a life insurance policy.
They look in a leaflet produced by *Heathbat Life Insurance*.
A section of the leaflet is shown below.

Heathbat Life Insurance

Annual premiums for life insurance policies

Published April 2013

	Life cover £20000			
	Male		Female	
	Non smoker	Smoker	Non smoker	Smoker
Age 20 to 29	£392	£592	£360	£560
Age 30 to 39	£480	£690	£408	£608
Age 40 to 49	£678	£904	£516	£725
Age 50 to 59	£814	£1130	£623	£886
Age 60 to 69	£926	£1330	£825	£1246
Age 70 to 79			£1180	£1560

Medical certificate are required for males and females aged over 55
No policies available for males aged 70 or over

Mr Read and Jade notice there are a number of interesting differences in the annual premiums for the life cover.
Give two possible reasons why there are differences in the annual premiums.

Reason 1:

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Reason 2:

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[2]

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10. *(a)* During an experiment, a scientist notices that the number of bacteria halves every second.
There were $2{\cdot}3 \times 10^{30}$ bacteria at the start of the experiment.
Calculate how many bacteria were left after 5 seconds.
Give your answer in standard form correct to two significant figures.

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[4]

(b) In a different experiment the number of bacteria is reduced by a quarter each second.
On this occasion the number of bacteria initially was x.
Form an equation to calculate the number of bacteria, r, remaining after t seconds.

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[3]

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11. A company produces coloured speech bubble stickers.

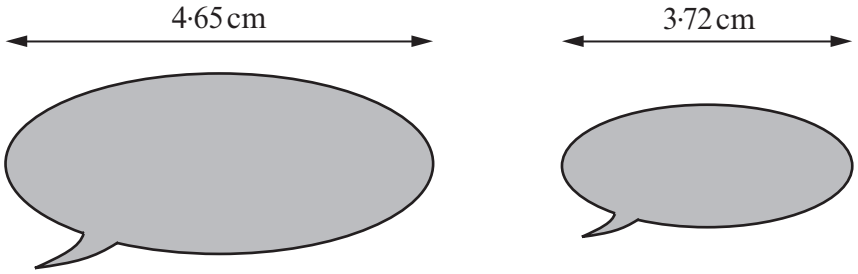


Diagram not drawn to scale

The two coloured speech bubble stickers shown above are similar.

One of the company's printer cartridges contains sufficient ink to produce 24 500 of the larger coloured speech bubble stickers.
A printer cartridge costs £25.
Calculate the cost of buying enough printer cartridges to print 15 million of the smaller coloured speech bubble stickers.

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[6]

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12. *(a)* *Morleys Building Society* had an account called *'Morley's Gold Account'* which paid 3·24% Gross.
At that time, the basic rate of tax was 20% and the higher rate of tax was 40%.
Complete the following table giving your answers correct to 2 decimal places.

	Gross rate	Net rate for basic rate taxpayers	Net rate for higher rate taxpayers
Morley's Gold Account	3·24%	..... %	..... %

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[4]

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(b) Alex has £25 000 to invest in a savings account.
She has picked up a leaflet in *Freads Building Society*.
The information shown below is taken from the leaflet.

Freads Building Society savings account information, updated 04/05/13

	Term	Interest paid	Minimum	Maximum
Oak savings account	2 years	6 monthly	£500	£100 000
Sycamore savings account	2 years	12 monthly	£1000	£50 000

The building society tells Alex that the *Oak savings account* would pay her 2·3% interest every 6 months, and the *Sycamore savings account* would pay her 4·6% per annum.

(i) Without calculations, which of these savings accounts would have the greater AER?
You must give a reason for your answer.

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[1]

(ii) Alex decides to invest her £25 000 for two years.
Calculate the difference between the interest she would receive if she selected to invest in the *Oak savings account* rather than the *Sycamore savings account*.
Show all your working.

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[6]

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13. The table below gives the density of 3 metals.

Metal	Density
Platinum	21·4 g/cm^3
Gold	19·3 g/cm^3
Silver	10·5 g/cm^3

Density can also be measured in 'troy ounces/cubic inch'.
The density of gold is 10·13 troy ounces/cubic inch.
Calculate the density of platinum in troy ounces/cubic inch.

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Platinum = ... troy ounces/cubic inch.

[2]

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14. A garden centre sells two types of spades.



Rounded-end spades cost £40 each and pointed-end spades cost £65 each.

The garden centre manager says that last weekend fewer than 45 spades were sold and more than £1560 was taken from sales of spades.

Let R represent the number of rounded-end spades sold and let P represent the number of pointed-end spades sold.

(a) Write down two inequalities, in terms of R and P that satisfy the information given by the garden centre manager.

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[2]

(b) Use the graph paper opposite to find a region that is satisfied by your inequalities. You must clearly indicate your region.

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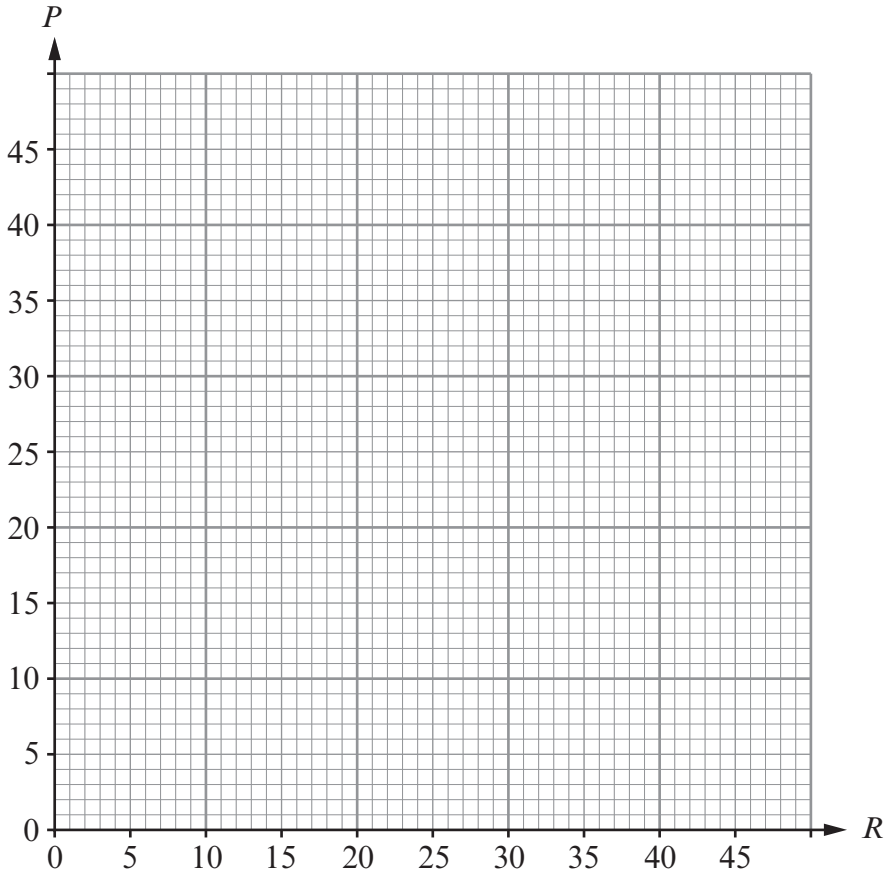
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[3]

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(c) Here are some statements made by sales assistants about the sales of spades last weekend.

Statement made by Iwan.

"20 rounded-end spades and 10 pointed-end spades were sold"

Statement made by Sid.

"22 rounded-end spades and 14 pointed-end spades were sold"

Use your graph to complete the following table to indicate whether each statement could be true or not.
You **must show on your graph** how you justify your decisions.

Name	**Statement**	**Could be true? Yes or No**
Iwan	20 rounded-end spades and 10 pointed-end spades were sold	
Sid	22 rounded-end spaces and 14 pointed-end spades were sold	

[2]

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15. A piece for a jigsaw is made in the shape of a right-angled triangle.
The piece has to be accurate so that the overall jigsaw fits together correctly.
The lengths shown on the right-angled triangle are correct to the nearest millimetre.

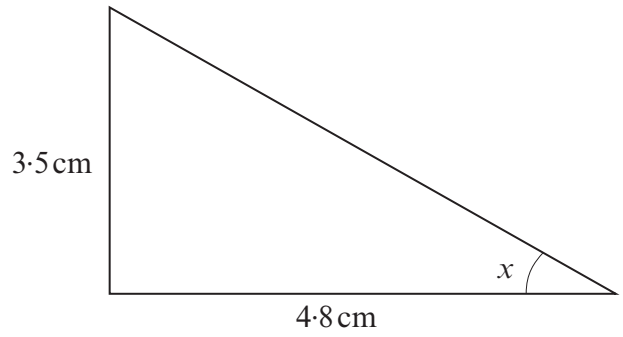


Diagram not drawn to scale

Calculate the **greatest** and **least** possible values for angle x.

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Greatest value of x = ... ° Least value of x = ... °

[4]

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16. A company makes a solid part for use in an engine.
The solid part is made by connecting a cylinder onto a hemisphere with the same radius.
A thin straight rod holds the solid part vertical when placed in the engine.
This rod is connected to the horizontal plate in the engine and the top rim of the cylinder, as shown in the diagram below.

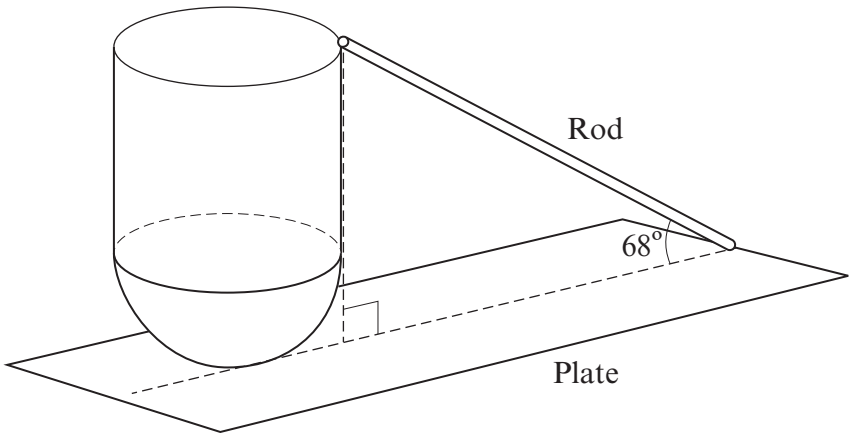


Diagram not drawn to scale

The total volume of the solid part is $8{\cdot}6\,cm^3$.
The radius of the hemisphere and cylinder is $0{\cdot}9\,cm$.
Calculate the length of the rod.

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[10]

END OF PAPER

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 2 (FOUNDATION TIER)

Applications Unit 2 Foundation June 2013		Final
1.(a)(i) Goods / Quantity / Cost Croissants 15 £1.50 Cheese 1 **£6.92** Pain au chocolat 10 **£3.2(0)** Coffee 4 £6.08 Bread 10 £9.90 Jam 5 **£6.20** TOTAL COST **£33.8(0)**	B1 B1 B1 B1	CAO CAO CAO FT. Award B4 for only an answer of £33.8(0)
(ii) 15/100 × 'their 33.8(0)' (£)5.07 ISW	M1 A1	FT from (a) An unsupported answer of £28.73 gets SC1 FT from (a) for SC1
(b)(i) 5 ÷ 0.62 (8.0645...)	M1	Or equivalent.
Buys 8 pain au chocolate (ii) Change = 4(pence)	A1 B1	Or equivalent. FT £5 –' their 8' × 0.62 B0 for £4 or 0.04p. Accept £0.04p *Watch for **misread** of 32p instead of 62p in (c) (5 ÷ 0.32 = 15(.625) can buy 15. There will be 20 pence change)*
(c) Labels of drinks Uniform scale starting from zero and labelled or key provided All correct heights and widths	B1 B1 B2	May use bar chart or pictogram Award B1 for 3 or 4 correct OR B1 for correct heights with inconsistent widths. FT if no scale on vertical axis but a uniform scale has been applied.
(d) (1 box <) 65/7 (£)9	M1 A1	Award M1 for (£)9.28(57...) or (£)9.29 or (£)9.3(0)
	15	
2. Item / Quantity / X or ✓ Orange juice 2 litres (✓) Mushrooms 50 kilograms **X** A bag of sugar 1 kilogram ✓ Tomato sauce 350 litres **X** Potatoes 5 grams (X) Large chocolate bar 100 grams ✓ Bottle of vinegar 250 millilitres ✓ Butter 500 grams ✓ Milk 4 litres ✓ Washing-up liquid 500 litres **X**	B4 4	Award B4 for all 8 correct responses Award B3 for 6 or 7 correct responses Award B2 for 5 correct responses Award B1 for 4 correct responses

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3. Identifying/sight of when Chloe can(/cannot) go Identifying/sight of when Gethin can go Identifying /sight of when Martyn can(/cannot) go Identifying common dates – 23rd Feb, 23rd & 30th March, 22nd & 29th June Latest date = 29th June	 B1 B1 B1 B1 B1 5	*Look at calendar for indication throughout the question* e.g. Sept, Oct, Nov, Dec crossed out Look for focus on Sundays (26th Jan), 23rd Feb, 23rd & 30th March, 27th April, 25th May, 22nd &29th June, 27th July, 24th & 31st Aug, 28th Sept, 26th Oct, (23rd Nov & 28th Dec) Sight of common dates triggers 1st 4 marks Award full marks for an unsupported correct answer
4. (Perimeter=) 12 + 9 + 12 + 9 = 42 (m) Number of panels (42 ÷ 3 =) 14 Cost 14 × (£)21.98 (£)307.72	M1 A1 B1 M1 A1 5	 FT their perimeter FT their number of panels *Alternative method: dividing by 3 to get no.of panels on 1 side B1* *4 + 3 + 4 + 3 M1* *(Number of panels =)14 A1* *Cost 14× (£)21.98 M1* *(£)307.72 A1* *Award SC3 for unsupported answer of (£)153.86*
5. A = 14 B = 15 2C = 12 C = 6	B1 B1 M1 A1 4	

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6. (a) (Cost of Adults=) 2 × 498 (£)996 (Cost of children=) 2 × 219 (£)438 Sea View 4×4×7 or All Inclusive 4×25×7 (£)112 (£)700 (Total cost=) (£)2246	M1 A1 M1 A1 M1 A1 A1 B1	*Penalise any <u>consistent</u> misreads of dates and number of children -1 each* FT provided at least 2 M1 marks awarded *An answer of £1550 gets M1 A1 M1 A1 M0 A0 B1*
Look for • spelling • clarity of labels • the use of notation (watch for the use '=' "£" being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	Q W C 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b) 3 or 4 angles correct and correctly labelled. 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR <u>If 0 OR 1 for their diagram or no diagram.</u>	B4 OR (B3) (B2) (B1) (B1)	Use the correct overlay and allow ±2°. Correct labels (Words NOT the frequency OR angle) 3 correct labels are enough. If only B1 is scored for the diagram and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded.
360/240 Angles are 93, 81, 60, 126. (c) 93.4(%)	(M1) (A1) B2 16	(1 is) 1.5° gets the M1 OR SC1 for all the correct percentages 25.8%, 22.5%, 16.7%, 35%. Award B1 for 93.(38235....).

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7. Volume of bar $20 \times 8 \times 4.5$ $= 720\ (cm^3)$ Volume of cube 2^3 $= 8\ (cm^3)$ Number of cubes $720 \div 8$ $= 90$	M1 A1 M1 A1 M1 A1 6	FT their bar and cube provided M2 awarded *Alternative method* *Attempt to divide all dimensions by 2 M2* *10 & 4 A1* *2.25 A1* *$10 \times 4 \times 2.25$ M1 FT if M2 awarded* *90 A1*
8. Howard (£)10 Betty $2/5 \times 10$ OR Charlie $2/5 \times 6$ (£) 4 (£)2.4(0)	B1 M1 A2 4	A1 for each correct answer
9. (a) Reason e.g. 'fair comparison', 'doing survey the same way' (b) (i) Name: Shaun Length in range 10.3 to 10.5(cm) (ii) Billy with a reason, e.g. 'Billy because no correlation', 'Billy because leaves are different', 'Billy as no connection between length and width' (iii) Reasonable straight line of best fit (iv) Width in the range 6.6 to 7.5 cm	B1 B1 B1 B1 B1 5	With some points above and some points below following the trend Ignore a 'tail' at the lower part of the line OR correct reading from their line of best fit
10. (a) All three stages of the appropriate calculation $560 \times (4.55 \div 37.8) \times 1.48$ (£)99.76 (b)(i) $560 / 10.75$ or $560 / 10\ ¾$ 52(.093 mph) (ii) C selected or implied with a reason, e.g. 'C because 52mph average means travels fast'	M3 A2 M2 A1 E1 9	M2 for sight of $560 \times 4.55 \div 37.8$, OR M1 for sight of $560 \div 37.8$, $4.55 \div 37.8$, $37.8 \div 4.55$, or 4.55×1.48 *Note:* *$560 \div 37.8$ (= 14.814814… gallons)* *$\times 4.55$ (= 67.407… litres)* *Use of 14.8 gives 67.34, use of 15 gives 68.25* Depends on M3 A1 for (£)99.7629.. or 99.6632 or 101.01 or other amount from premature approximation M1 for 560/10.45 or 560/675 or 560/645 CAO Only FT provided their answer in $70 \geq$(b)(i)≥ 50
11. Design / n / r / Satisfies the criteria? Yes or No Rings 3 3 Yes Petals 4 4 Yes Legs 0 3 No	B2 B1 3	For correct first 2 columns OR B1 for any 4 correct entries in the first 2 columns For correct final column, FT appropriate decision for their lines and rotational responses written in the table
12.(a) Median / Range / Mode Internet 4 39 2 Town 16 20 14 (b) Statement, e.g 'not typical', 'the town centre shops are actually in need of more help rather than the internet businesses' 'mode for businesses is actually only twice'	B3 E1 4	B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries

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UNIT 2 (HIGHER TIER)

<table>
<tr><th>Applications Unit 2 Summer 2013 Higher Tier GCSE</th><th></th><th>Final</th></tr>
<tr><td>1(a)

(D3 =) C3 – B3

(F3=) D3 * E3 OR (F3=) D3 × E3 or equivalent

(b) (i) D2 219 F2 1095
D3 448.8(0) F3 3590.4(0)
F4 5000
(ii) (G5 =) F2 + F3 + F4 OR (G5 =) SUM(F2:F4)</td><td>

B2

B1

B1

B1

5</td><td>Penalise once only for consistent incorrect cell number
B1 for 3C – 3B or 1108.8(0) – 660
B0 for B3 – C3
Accept (C3 – B3) * E3 or (C3 – B3) × E3
Do not accept numerical solutions
Ignore inclusion of £ sign

Accept if formula continued for addition of further F cells</td></tr>
<tr><td>2.

<table><tr><th>Design</th><th>n</th><th>r</th><th>Satisfies the criteria?
Yes or No</th></tr><tr><td>Rings</td><td>3</td><td>3</td><td>Yes</td></tr><tr><td>Petals</td><td>4</td><td>4</td><td>Yes</td></tr><tr><td>Legs</td><td>0</td><td>3</td><td>No</td></tr></table></td><td>

B2

B1

3</td><td>

For correct first 2 columns
OR B1 for any 4 correct entries in the first 2 columns
For correct final column, FT appropriate decision for their lines and rotational responses written in the table</td></tr>
<tr><td>3. Howard (£)10
Betty 2/5 × 10 OR Charlie 2/5 × 6
(£) 4 (£)2.4(0)</td><td>B1
M1
A2

4</td><td>

A1 for each correct answer</td></tr>
<tr><td>4. (a) Reason e.g. ‘fair comparison’, ‘doing survey the same way’
(b) (i) Name: Shaun Length in range 10.3 to 10.5(cm)
(ii) Billy with a reason, e.g. ‘Billy because no correlation’, ‘Billy because leaves are different’, ‘Billy as no connection between length and width’
(iii) Reasonable straight line of best fit

(iv) Width in the range 6.6 to 7.5 cm</td><td>B1

B1
B1

B1

B1

5</td><td>

With some points above and some points below following the trend
Ignore a ‘tail’ at the lower part of the line
OR correct reading from their line of best fit</td></tr>
</table>

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5(a) All three stages of the appropriate calculation $560 \times (4.55 \div 37.8) \times 1.48$	M3	M2 for sight of $560 \times 4.55 \div 37.8$, OR M1 for sight of $560 \div 37.8$, $4.55 \div 37.8$, $37.8 \div 4.55$, or 4.55×1.48 *Note:* *560 ÷ 37.8 (= 14.814814… gallons)* *× 4.55 (= 67.407… litres)* *Use of 14.8 gives 67.34, use of 15 gives 68.25*
(£)99.76	A2	Depend s on M3 A1 for (£)99.7629.. or 99.6632 or 101.01 or other amount from premature approximation
Look for • spelling • clarity • the use of notation (watch for the use of '=', £, being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer • QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b)(i) 560 / 10.75 or 560 / 10 ¾ 52(.093 mph) (ii) C selected or implied with a reason, e.g. 'C because 52mph average means travels fast' 11	M2 A1 E1	M1 for 560/10.45 or 560/675 or 560/645 CAO Only FT provided their answer in 70≥(b)(i)≥50
6(a) $0.5 \times 6 \times 8 \times 130$ 3120 (cm^3) (b) Greater (by) 120 (cm^3) 4	M2 A1 B1	M1 for $0.5 \times 6 \times 8 \times 1.3(0)$ or for ½ × 6 × 8 × 'digits 13 with incorrect place value' Do not accept 0.5×6×8×10 as area cross section CAO FT difference between 'their 3120' and 3000 correctly evaluated with appropriate statement of greater or less
7(a) Internet: Median 4, Range 39, Mode 2 Town: Median 16, Range 20, Mode 14 (b) Statement, e.g 'not typical', 'the town centre shops are actually in need of more help rather than the internet businesses', 'mode for businesses is actually only twice' 4	B3 E1	B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries

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8(a) Method to calculate costs, e.g. 14 portions is 2(.)19 + 14 ×(0.)12 or equivalent calculation in pence	M1	OR for 1 portion, 2.19÷14 + 0.12 (£0.2764…) or equivalent calculation in pence. Units must be consistent
(Cost of making 14 portions) (£)3.87	A1	Allow B1 (instead of M1, A1) for costs (£)3.27 (considering 9×0.12+2.19)
(Sales from 9 bowls of soup =) 9 × 2.95 (= £26.55)	M1	Do not accept for '(2.95 ± ….)×9 unless used appropriately in further working
(Profit) (£)22.68	B1	CAO
(% profit =) $\frac{22.68}{\text{'their costs'}} \times 100$ 586(.046%)	M1 A1	FT provided M1 awarded and profit is (£)22.68 CAO
(b) (x – 1) × 1.6 + 13.4 = 35.8 OR x = $\frac{35.8 - 13.4}{1.6}$ +1	M2	M1 for 1.6×x + 13.4 = 35.8, or x = (35.8 – 13.4)/1.6, OR M1 for equation would be correct apart from missing brackets, OR M1 for correct equation expressed in words *Accept missing brackets if implied by a correct response*
15 (cartons)	A1	If no marks allow SC1 for 15 (cartons)
(c) 2c + 4.5s = 3(.)69 and 5c + 7.5s = 6(.)90	B2	Accept 'carrots' and 'swede' written in full within an equation B1 for either equation, or inconsistent place value for money
Method to solve, e.g. equal coefficients	M1	FT provided at least 1 equation is correct and equivalent level of difficulty Allow 1 slip in non equated variable
Correct first value Method to find the second variable Correct second value	A1 m1 A1	FT from their first value Carrots 45(p) per kg, Swede 62(p) per kg Accept 0.45 and 0.62. If units are given they need to be correct for A1
		Do not accept unsupported answers or use of trial & improvement methods. No marks
	15	
9. Any 2 correct separate reason based on risk: Reason: Females (pay less) longer life expectation Reason: 'Smokers life expectation shorter than non smokers (of same age)' Reason: 'Premiums increase with age as risk increases' Reason: 'Older people pay more as shorter time to make payments'	E2	E1 for one correct reason Do not accept a statement without giving reason, Do not accept e.g. 'premiums increase with age', or 'smokers pay more' within statement of why.
	2	
10(a) Idea to divide by 2 or a power of 2 $2.3 \times 10^{30} / 2^5$ or equivalent 7.2×10^{28} (b) $r = 0.75^t \times x$	M1 m1 A2 B3	Dividing their 2.3×10^{30} by 2^5 or equivalent A1 for $7.1875.. \times10^{28}$ B2 for correct expression $0.75^t \times x$ B1 for $0.75x$, x -1/4 x, $0.75^2 x$, … *SC2 for $r= 0.25^t \times x$ or SC1 for $0.25^t \times x$ or equivalent*
	7	

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11. Idea of ratio or length scale factor, e.g. sight of 0.8 or 1.25 Area scale factor used correctly $\div 0.8^2$ or $\times 1.25^2$ or equivalent 1 cartridge to make 38281(.25) smaller bubbles 15 000 000 ÷ 38281(.25) 391.8… or 392 cartridges needed Cost (£)9800	M1 M1 A1 M1 A1 A1 6	 Evidence of this implies also the first M1 FT their linear scale factor squared used correctly for all further marks FT 'their 38281.25'number of smaller bubbles provided both M1 awarded CAO. FT for the cost of a whole number of cartridges rounded up. (Note 9795.92 is A0) *Allow M1 and SC1 for linear calculation with answer (£)12 250*
12(a) 3.24×0.8 OR 3.24×0.60 2.59(%) AND 1.94(%) (b)(i) Oak AND a reason showing understand of AER (ii) Oak (Total amount after 2 years = £)25000×1.023^4 (Total amount £)27380.57(37…) OR (Interest £)2380.57(3696…) Sycamore (Total amount after 2 years = £)25000×1.046^2 (Total amount £)27352.9(0) OR (Interest £)2352.9(0) (Difference in interest is £) 27.67	M1 A3 E1 M2 A1 M1 A1 B1 11	Or other complete method A2 for 2.59(2) AND 1.94(4) A1 for either 2.59(2) OR 1.94(4) *If no marks SC1 for sight of digits 2592* ***and*** *1944 (incorrect place value), OR for 0.65* ***and*** *1.3(0)* Reason must say about comparing annually Accept 'Oak, because they give more interest (annually)' Or for alternative complete method compounding 4 times, or M1 for 2.3% × 25000 (= £575) Do not accept other rounding or truncation Or alternative complete method Do not accept other rounding or truncation FT provided M mark(s) for Oak or Sycamore awarded, with all this answer to nearest penny
13. Density = $\frac{21.4 \times 10.13}{19.3}$ = 11.2(322…troy ounces/cubic inch)	M1 A1 2	
14(a) R + P < 45 40R + 65P > 1560 (b) Line R + P = 45 shown Line 40R + 65P=1560 shown Region between the lines indicated (c) **Using their graph** to show Iwan's statement outside the region with 'No' in the table AND shown on the graph **Using their graph** to show Sid's statement inside the region with 'Yes' in the table AND shown on the graph	B1 B1 B1 B1 B1 B1 B1 7	*If no marks, SC1 for R+P…45 and 40R +65P…1560, with the gaps here both being inequalities* FT their inequalities if possible from a slip Accept FT from either line correct but for a similar region **MUST** be a FT from their graph in (c) provided at least 1 line is correct. Do not accept numerical explanations. Accept unambiguous unlabelled plots provided the table is completed correctly

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15. Sight of 3.45, 3.55, 4.75 and 4.85 tan x = 3.55/4.75 and tan x = 3.45/4.85 Greatest x = 36.77(3..°) or 36.8(°) or 37(°) Least x = 35.4(25...°) or 35.43(°) or 35(°) 4	B1 M1 A1 A1	 FT their least and greatest provided > < or > then values given in the question for M1 only From correct working From correct working
16. Volume hemisphere = ½ × 4/3 × π × 0.9^3 = 1.5(268… cm^3) Volume cylinder = 8.6 – volume hemisphere correctly evaluated (7.1 cm^3) 7.1 = π × 0.9^2 × h h = 7.1 / (π × 0.9^2) Answers in the range 2.77 to 2.8 (cm) Overall height = 3.7 (cm) Rod length = 3.7/sin68° Answers in the range 3.96 to 4 (cm) 10	M1 A1 B1 M1 M1 A1 B1 M2 A1	 Accept rounded or truncated 1.53 or 1.52 FT their volume hemisphere CAO CAO FT provided all M marks awarded FT their 3.7 provided >0.9 M1 for sin68° = 3.7/rod CAO

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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

P.M. TUESDAY, 22 January 2013

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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 **7***(a)*.

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

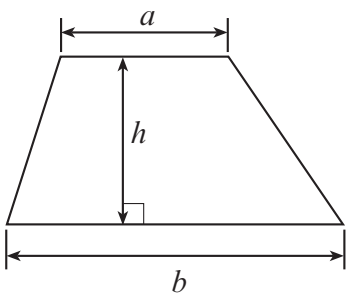
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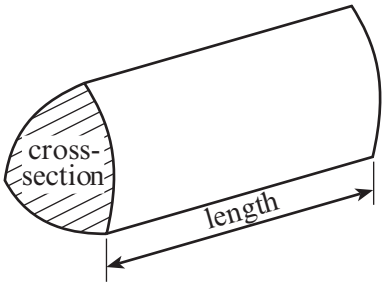
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Formula List

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

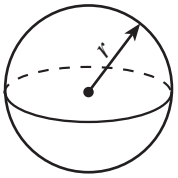


Volume of prism = area of cross-section × length



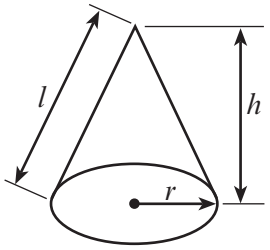
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

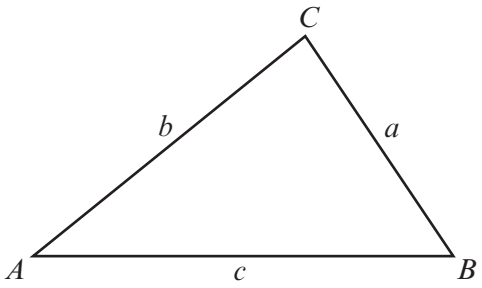


In any triangle ABC

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

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

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Examiner only

1. Kitchen cupboards and worktops are measured in mm.



(a) A worktop is 4500 mm long.
How much is this in metres?

.....

[1]

(b) A rectangular worktop measures 3200 mm long by 750 mm wide.
Calculate the area of the top surface of the worktop in m^2.

.....

.....

.....

[2]

(c) A kitchen cupboard is in the shape of a cuboid.
Its capacity is 405 000 000 mm^3.
Internally, the cupboard measures 600 mm wide and 750 mm deep.
Calculate the internal height of the cupboard in mm.

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[2]

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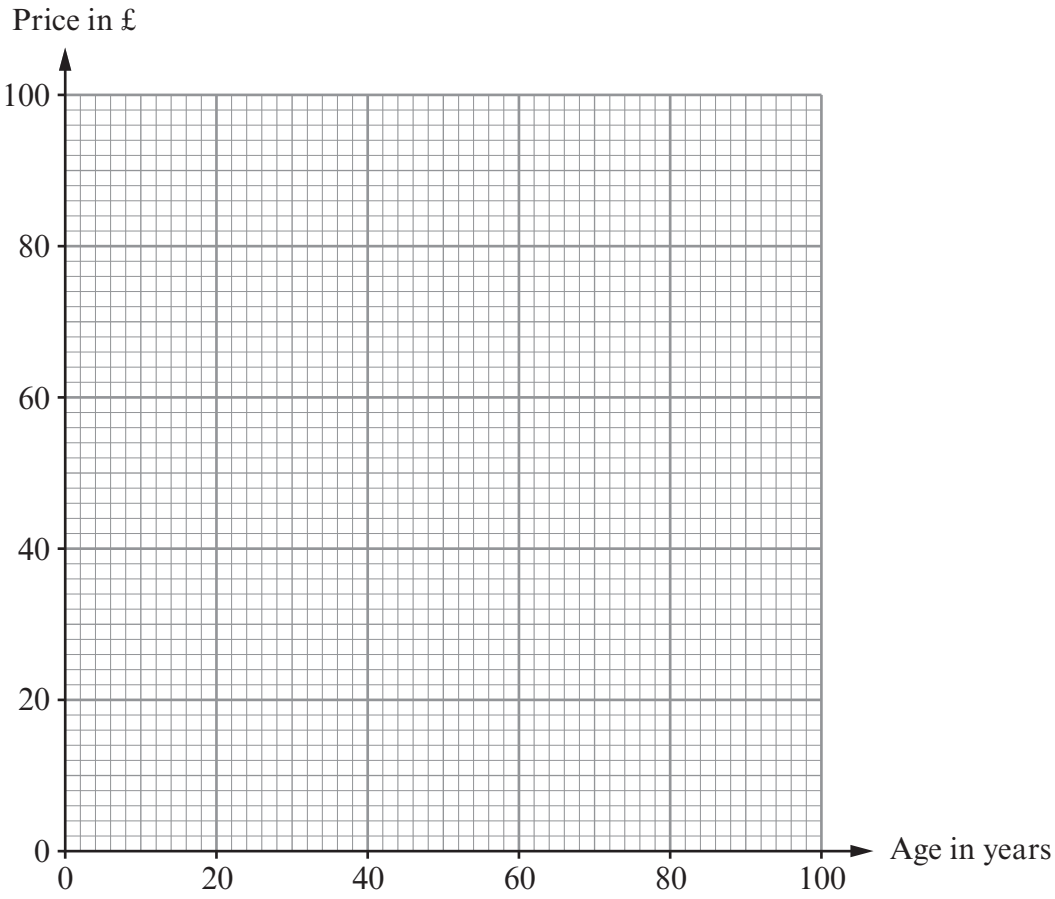
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2. The age and price of each of 8 clocks in an antique shop are recorded in the table.

Age in years	12	40	70	50	46	80	62	32
Price in £	90	60	80	50	20	40	20	28

(a) Draw a scatter diagram to display these ages and prices.

[2]



(b) Write down the price of the oldest clock.

Price £ .....

[1]

(c) Does the scatter diagram indicate that there is a correlation between the age and price of the clocks? You must give a reason for your answer.

.....

.....

.....

[1]

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3. Jona went on holiday to Poland.
Before going, she went into her local travel money exchange shop to buy some Polish zloty.

Jona only had £250 to spend on buying zloty.
She wanted to buy as many zloty as possible.
Unfortunately, the travel money exchange shop only had 50 zloty notes.
The exchange rate to buy zloty was £1 = 4.37 zloty.

(a) (i) How many zloty did Jona buy?

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[3]

(ii) How much did she pay for the zloty?

.....

.....

[2]

(b) Whilst in Poland, Jona spent 340.40 zloty.
On returning from her holiday, Jona changed her zloty back to pounds.
Unfortunately, the money exchange shop would only buy back a whole number of zloty.
The exchange rate used for changing zloty back to pounds was £1 = 4.43 zloty.
Calculate how much Jona received back from the money exchange shop.
Give your answer to the nearest penny.

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[3]

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Turn over.

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4. Airlines publish flight records showing the percentage of flights that arrived on time at their destinations.



An extract from these flight records is shown below.

Flights from Cardael to Belslow Autumn 2012			
Airline	**Flight number**	**Percentage of flights arriving on time**	**Average ticket price including taxes, in £**
Far Flung	FF4356	74%	£100
Celtic Flights	CF3967	99%	£65
Roly Air	RA2099	96%	£65

Holly intends to fly from Cardael to Belslow to go to an appointment in Belslow city centre.
If her flight arrives on time, she can catch the free bus to the city centre.
If her flight arrives late, then she must take a taxi to the city centre costing £25.

Which airline should Holly choose to fly with?

You must
- consider each of the airlines,
- give a reason for your choice of airline **and** also reasons for not choosing each of the other two airlines.

Write your answers in the table opposite.

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Airline	Choice, Yes or No?	Reasons
Far Flung	.....	.....
Celtic Flights	.....	.....
Roly Air	.....	.....

[3]

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5. The spreadsheet below gives details of the hours worked and the rate of pay for three of the employees who work in a supermarket.

	A	B	C	D	E
1	Employee	Hourly rate in £	Weekday hours worked	Weekend hours worked	Total week's pay in £
2	Erica	9.50	22	3	266
3	Georgie	12.80	20	5	384
4	Ranj	9.80	17		245

All employees earn double the hourly rate for any weekend hours worked.

(a) Use the entries in the spreadsheet to calculate the hidden value of cell **D4**.

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[3]

(b) Write down the formula, using cell references, used to calculate the entry for cell **E3**.

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[4]

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6. Tanya used a stem-and-leaf diagram to record the prices of two makes of mobile phone on display in a supermarket.
Tanya's stem-and-leaf diagram is shown below.

NewKey		eLime
1	5	0 2
	4	2 3
8 7	3	1 1 6 8
3 3	2	3
8 6 2 1	1	5

Key: NewKey 1 | 5 means £51
eLime 1 | 5 means £15

(a) Tanya has forgotten to record a £45 NewKey phone and a £25 eLime phone.
Complete the stem-and-leaf diagram above by entering this extra data for Tanya.

[2]

(b) Including the extra data you have entered for Tanya, complete the following table.

	Median in £	Range in £	Mode in £
NewKey			
eLime			

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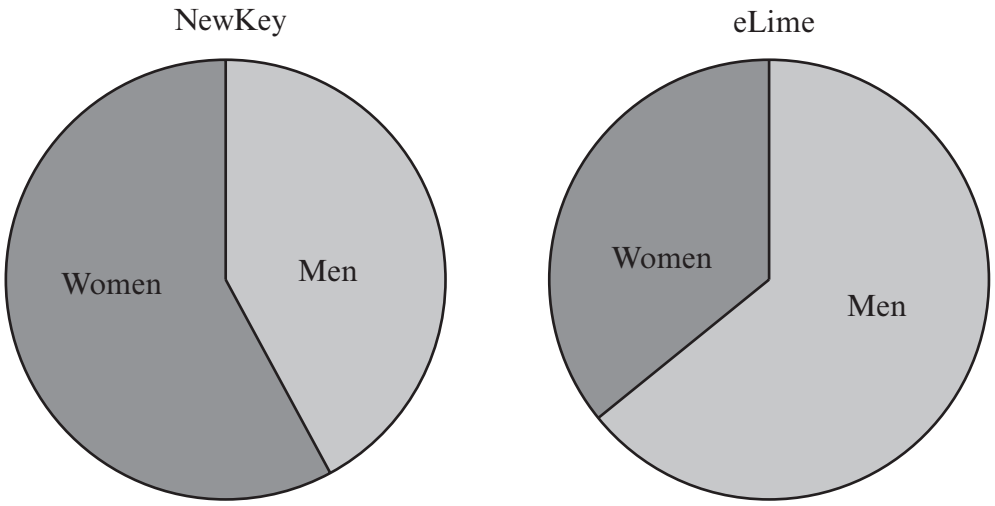
[4]

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(c) Tanya has been given two pie charts, by the supermarket manager, comparing the sales of the two makes of phones.



The supermarket manager says,

"More men buy NewKey phones than eLime phones".

Explain how this could be true.

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.....

[1]

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7. Sammy-Jo is thinking of setting up a business to sell hand-knitted scarves.

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

In order to set up her business, she needs to arrange a loan of £2000.
She is offered two different options for a loan.

Loan company	Repayment terms for a £2000 loan
Driftwood loans	£68 a month for 3 years
Grain Bank	First payment is 10% of the loan and then 15 monthly payments of £146

To compare these two different loans, Sammy-Jo decides to calculate how much extra she would have to pay back as a percentage of the original £2000 loan offered by each company.

- Calculate these percentages so that Sammy-Jo can make this comparison.
- Explain why this is not the only comparison Sammy-Jo should consider when deciding which loan to accept.

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[8]

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(b) Sammy-Jo provides the wool for people to knit scarves.
All the scarves have the same width and all the scarves have the same length.



It takes 3 hours and 30 minutes to knit a scarf.
Sammy-Jo decides to pay each person the same amount.
She thinks that a payment of £26.60 per scarf is fair.

(i) Calculate the rate of pay per hour for the people knitting the scarves.

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[2]

(ii) Each scarf is 1·3 m long.
Calculate the rate of pay per metre knitted, correct to the nearest penny.

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[2]

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8. David is a scientist.
As a result of an experiment, he finds connections between two variables f and g.
In order to write the conclusion he needs to find the values of f and g.

These are the connections that David finds:

- Twice f added to three times g gives a total of 5
- Three times f added to four times g gives a total of 4

Form a pair of simultaneous equations and solve them to find the values of f and g.

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[5]

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9. *(a)* A garage in a European country has included VAT at $17\frac{1}{2}\%$ in the car prices shown on the information tickets.



FireFly 2.6 litre
Sports Coupé

Price
34 990 euros including VAT

The government decides to change the rate of VAT to 24%.

Calculate the price to be displayed on the information ticket for the car shown above following the change in VAT.
Give your answer correct to the nearest ten euros.

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[4]

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(b) The garage also provides the dimensions of all the cars they sell.

FireFly 2.6 litre
Sports Coupé

Overall width with wing mirrors folded in 1770 mm



Overall width with wing mirrors folded out 2007 mm



Height of vehicle	1447 mm
Overall length	4581 mm
Interior headroom	984 mm

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All the measurements are given correct to the nearest 1 mm.

A wing mirror is fixed to each side of the car.
Calculate the greatest possible **increase** in the width of the car when just one wing mirror is folded out.

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[4]

(c) The satellite navigation systems for these cars are shipped in boxes.
The dimensions of the box are 12 cm by 8 cm by 6 cm, with all of these measurements given correct to the nearest centimetre.
Calculate the minimum volume of the box in cm^3, correct to 1 decimal place.

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[3]

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10. The table below shows some information from the 1881 census.

Occurrences of the surname 'JONES' in the 1881 census	
Region	**Total number of occurrences**
Lancashire	34 724
Glamorgan	31 945
Denbighshire	19 984
London	18 538

Use this information to find in **standard form**, correct to **two significant figures**,

(a) the total number of occurrences of the surname Jones in Denbighshire,

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[2]

(b) the total number of occurrences of the surname Jones in the four regions.

.....

.....

[2]

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11. A tree surveyor is working out the height of a vertical tree.
The surveyor is able to measure the angle of elevation of the top of the tree from his measuring instrument, which is 1·8 m above ground level.
When the surveyor is standing 19 m from the base of the tree, the angle he measures is 56°.

A sketch of this situation is shown below.

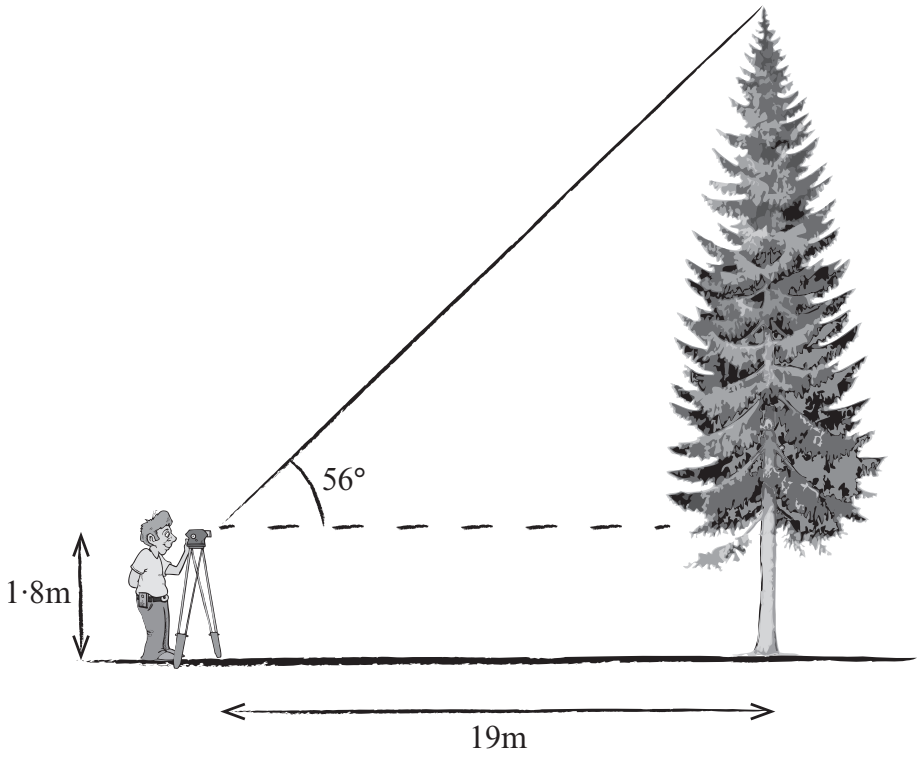


Diagram not drawn to scale

Calculate the full height of the tree.

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[4]

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12. A large hotel is buying new sofas for the seating areas.

The sofas available for them to buy can seat either 3 people or 4 people.

The hotel does not have space for more than 30 sofas.

The hotel wants to provide seating for at least 80 people.

Let t represent the number of 3-person sofas bought.
Let f represent the number of 4-person sofas bought.

(a) Write down two inequalities that satisfy the conditions that the hotel has given.

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[3]

(b) Use the graph paper opposite to find the region that is satisfied by your inequalities.

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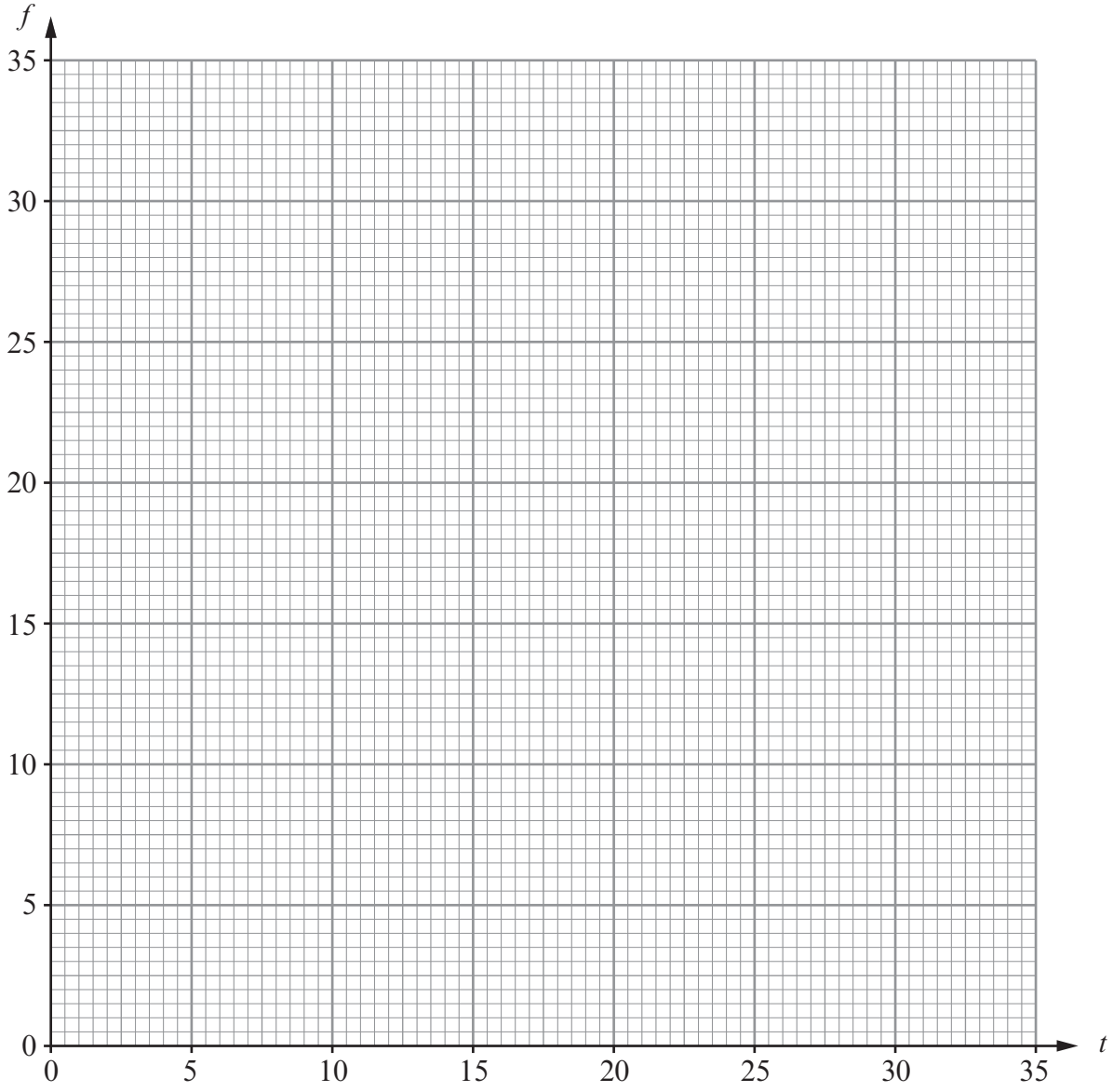
.....

[3]

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(c) Complete the order form below by selecting a suitable number of 3-person and 4-person sofas for the hotel to buy.

Sofa	Number to buy
3-person	
4-person	

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[1]

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Turn over.

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Examiner only

13.



Ace Clothing UK

'Ace Clothing UK' design and make T-shirts.
The company has found that sales of their T-shirts have trebled each year from 2009 to 2012.
In 2009, 'Ace Clothing UK' sold 2300 T-Shirts.

(a) Calculate the **total** number of T-Shirts sold by 'Ace Clothing UK' from the start of 2009 to the end of 2012.

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[3]

(b) At the end of 2009, 'Ace Clothing UK' decided that each year they would increase the price they would charge for their T-shirts.
It was decided that the increase each year would be 12% of the **previous year's price**.
This would continue for the next 3 years.
'Ace Clothing UK' charged £3.60 for each of their T-shirts during 2012.

Calculate the price that 'Ace Clothing UK' charged for each of their T-shirts during 2009, correct to the nearest penny.

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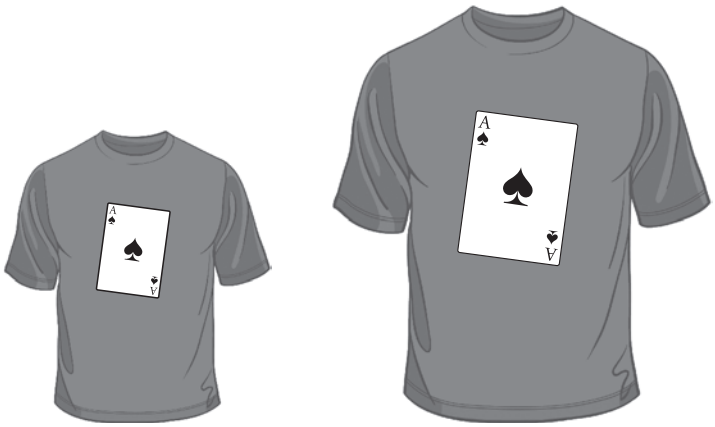


Diagram not drawn to scale

(c) For 2013, 'Ace Clothing UK' is considering charging extra for the size XXXXL T-shirts. They are thinking of basing the charge for their T-shirts on the area of cotton used to make the T-shirt.

The size L and size XXXXL T-shirts are mathematically similar.
The size L measures 50 cm across and the size XXXXL measures 70 cm across.

'Ace Clothing UK' is considering charging £4.62 for each of their size L T-shirts in 2013.

Calculate how much 'Ace Clothing UK' is now considering charging for their size XXXXL T-Shirt in 2013.

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[4]

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14. The company 'Graham Design' manufactures parts for water tanks.
These parts are always 3D solids.

(a) The part shown below is a cuboid with a square based pyramid fitted exactly onto one of its faces.

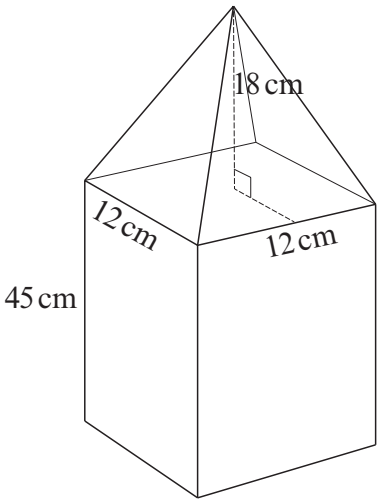


Diagram not drawn to scale

The cuboid has dimensions 12 cm by 12 cm by 45 cm.
The square based pyramid has a perpendicular height of 18 cm.
The square based pyramid is fixed exactly onto one of the 12 cm by 12 cm faces of the cuboid.
The part has 9 faces.
The faces of the part are treated with a water-proofing product.
The water-proofing product costs 4.5p per cm^2.
Calculate the cost of water-proofing the 9 faces of the part.

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[6]

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(b) 'Graham Design' also manufactures a different part, which is also a 3D solid.
Fixing a cone exactly on to the uniform cross section of a cylinder forms this 3D solid.
The radius of the cylinder and cone is 6 cm.
The overall length of the part is 22 cm.
The volume of the cylinder is 1018 cm^3.
Calculate the volume of the 3D solid giving your answer to the nearest $\frac{1}{2}$ litre.

[6]

END OF PAPER

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2013

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INTRODUCTION

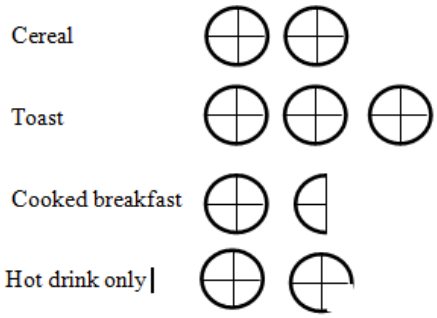
The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 2 - FOUNDATION TIER

Applications Unit 2 Foundation Tier January 2013		Final
1. (a)(i) 2 × (£)1.99 + (£)2.10 + 3 × (£)1.80 (£)11.48 (ii) 6 × (£)1.29 (£)7.74 (b) 48 ÷ 6 8	M1 A1 M1 A1 M1 A1 6	Allow one omission/extra CAO FT 'their number of sandwiches' used in part (a) FT 'their number of men'
2. (a) 6 (b) 8 + 12 + 6 + 7 33 (c) For correct pictogram drawn with labels  	B1 M1 A1 B3 6	 For adding frequencies Award B2 for 3 correct, B1 for 2 correct Penalise -1 for no labels
3. (a) A and D B and H (b) F and G K and J	B1 B1 B1 B1 4	*Accept pairs of answers in any order in both parts*
4. (a) Correct completion of Rangoli Pattern (10 lines) (b) Triangle in correct position in 4th diagram	B2 B2 4	Award B1 for 5 or more lines correctly drawn Award B1 for the triangle drawn in correct position in 2nd or 3rd diagram OR award B1 for incorrect triangle drawn in 2nd diagram but then a correct FT drawn in (3rd and) 4th diagram(s).
5. (a) Length of pen – 14cm Height of door – 2m Weight of a tin of beans – 420g Capacity of a can of fizzy drink – 330ml Weight of a bag of sugar – 1kg (b) Better buy is 3kg of potatoes for 80 pence with a reason that 3kg is approx 6(.6)lbs, so are getting a greater weight of potatoes (for the same money).	B4 E2 6	Award B3 for 3 or 4 correct, B2 for 2 correct, B1 for 1 correct. Award E1 for a partial reason or award E1 for sight of 6(.6)lbs with no reason Eg if say 3kg is heavier than 5lbs award E1 Or 3 kg gives ore potatoes for the same money
6. (a) 40/100 × 140 (£)56 (b) coat on Tuesday costs (140 – 56 =) (£)84 20/100 × 84 (£)16.8(0) Coat costs (84 – 16.80=) (£)67.2(0)	M1 A1 B1 M1 A1 B1 6	Answer of (£)84 in this part gets M1 A0 FT 'their 56.' *Award this B1 if shown in part (a)* *Alternative method 80/100 × 84 M2* *=(£)67.2(0) A1* FT 'their 84 and 16.80' if at least M1 awarded in (a) or (b) *If no marks awarded in (b)* *Award SC2 for an answer of 112* *Or Award SC1 for sight of 28 or for 1 slip in workings towards answer of 112*

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Applications Unit 2 Foundation Tier January 2013		Final
7. (Cost of Sausages) 240 ÷ 15 × 5.20 (£)83.2(0) (Cost of Rolls) 240 ÷ 12 × 1 (£)20 (Total) (£) 103.2(0) 35/100 × 103.2(0) (£)36.12 (¼ × 103.2(0)=) (£)25.8(0) (103.2(0) – 36.12 – 25.8(0)=) (£)41.28 (41.28 ÷ 8 =) (£)5.16	M1 A1 M1 A1 B1 M1 A1 B1 B1 B1 10	If M0 A0 Award SC1 for 16 (kgs) If answer given as **20 packs** Award SC1 FT 'their (£)83.20' + 'their (£)20' provided at least M1 awarded FT 'their (£)103.2(0)' FT 'their (£)103.2(0)' but not 'their (£)36.12' FT 'their (£)103.2(0) – 'their (£)36.12' – ' their (£)25.80' *Watch for 103.2(0) – 60% of 103.2(0) or 40% of 103.2(0)* FT 'their remaining cost' ÷ 8
8. (a) (area =) 45 × 25 1125(m^2) (Cost =) 1125 × (£)85 (£) 95625 Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £, m^2 being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer (b) 60(±2) /360 ISW	M1 A1 M1 A1 Q W C 2 B2 8	 FT 'their area' *If no marks awarded* *Award SC2 for sight of (£)11900* *OR Award SC1 for ×85 correctly* QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. Award B1 for sight of 60 (±2°) or for a numerator <90 with a denominator of 360
9. $2x + x + 7 = 25$ $3x = 18$ $x = 6$	B1 B1 B1 3	FT until 2nd error This line implies 1st B1 Answer only of (x =) 6 award B0 B0 B1
10. 16000 × 6.5 ÷ 100 OR 16000 × 6.5 × 5 × 5 OR ÷ 100 Simple interest = (£)5200 Total paid (16000 + 5200 =) (£)21200	M1 m1 A1 B1 4	Or sight of 1040 FT their 5200 provided M1 awarded
11.(a) All 8 points correctly plotted (b) (£)40 (c) Implies "no" with a reason (e.g. points scattered, or not in line, etc.)	B2 B1 E1 4	B1 for at least 6 points correctly plotted, OR all correctly plotted but joined dot-to-dot OR FT from their graph for their oldest clock Accept statements saying it is 'not positive **and** not negative correlation'

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Applications Unit 2 Foundation Tier January 2013		Final
12. No, Yes, No Far Flung: No and most expensive or most often late Statement that implies Celtic Flights is more reliable than Roly Air	 B1 E1 E1 3	Accept percentages used within comparison Do not accept percentages quoted without interpretation. Accept statements such as '<u>only</u> 74%' as a comparison No with statement of 1 of the 2 reasons Unambiguous and not contradicted. In either reason box for Celtic Flights or Roly Air
13.(a) (245/9.8(0) - 17) or (245−9.8(0)×17)÷9.8(0) (=25 – 17 = 8) ÷2 Conclusion D4 entry is 4 (i.e. half their 8) (b) (=) C3 × B3 + 2 × D3 × B3 OR (=) C3 × B3 + D3 × B3 + D3 × B3 OR (=) (2 × D3 + C3) × B3 OR equivalent	M1 m1 A1 B4 7	Or equivalent method that could lead to 8 Depends on M1. May be embedded CAO A correct answer in the table gets M1, m1, A1 Ignore 'E3 ='. Accept '*' as '×' Award *B3* for sight of C3 × B3 + D3 × B3, or 2 × D3 × B3, or D3 × B3 + D3 × B3, or (2 × D3 + C3) Award *B2* for sight of 'B3×C3' or 'B3×D3' Award *B1* if shown numerically, with an attempt then to use a cell reference *Penalise consistent incorrect row -1 only*
14. $AC^2 = 75^2 + 140^2$ $AC^2 = 25225$ OR $AC = \sqrt{25225}$ AC = 158.8(238017) or 159 (m)	M1 A1 A1 3	
15.(a) 5 | 4 and 2 | 5 (b) Median in £ / Range in £ / Mode in £ NewKey: 23 / 40 / 23 eLime: 36 / 37 / 31	B2 B4 6	B1 for either entered correctly *FT their entries, or no extra entries, to mark (b)* Median, mode and range correct, OR B3 for 4 or 5 correct entries B2 for 3 correct entries B1 for 1 or 2 correct entries

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UNIT 2 - HIGHER TIER

Applications Unit 2 January 2013 Higher Tier GCSE		Final
1.(a) 4.5(00 m) (b) 3200 × 750 with an attempt to change units 2.4 (m^2) (c) 600 × 750 × .... = 405 000 000 900 (mm)	B1 M1 A1 M1 A1 5	 Attempt to change units needs evidence of $\div 10^n$ where $n \geq 3$ Or equivalent method
2.(a) All 8 points correctly plotted (b) (£)40 (c) Implies "no" with a reason (e.g. points scattered, or not in line, etc.)	B2 B1 E1 4	B1 for at least 6 points correctly plotted, OR all correctly plotted but joined dot-to-dot OR FT from their graph for their oldest clock Accept statements saying it is 'not positive **and** not negative correlation'
3. (a) (i)250 × 4.37 = 1092.5(0) (Buys)1050 (zloty) (ii) 1050 ÷ 4.37 = (£)240.27(46) (b) (1050 – 340.40 =) 709.6(0) 709 ÷ 4.43 (£) 160.04	M1 A1 A1 M1 A1 B1 M1 A1 8	 FT provided M1 awarded FT 'their 1050 zloty' provided rounded to the nearest 50,must be in zloty not £s FT 'their (a)' provided >340.40 FT rounding down their 709.60 to whole number Accept (£)160.05 An answer of (£)160.18 should be awarded B1 then SC1 in (b) An answer of (£)160.27 should be awarded SC1, with B1 only if 709.6(0) seen
4. No, Yes, No Far Flung: No and most expensive or most often late Statement that implies Celtic Flights is more reliable than Roly Air	 B1 E1 E1 3	Accept percentages used within comparison Do not accept percentages quoted without interpretation. Accept statements such as '<u>only</u> 74%' as a comparison No with statement of 1 of the 2 reasons Unambiguous and not contradicted. In either reason box for Celtic Flights or Roly Air
5.(a) (245/9.8(0) - 17) or (245−9.8(0)×17)÷9.8(0) (=25 – 17 = 8) (78.4(0) ÷9.8(0) =8) ÷2 Conclusion D4 entry is 4 (i.e. half their 8) (b) (=) C3 × B3 + 2 × D3 × B3 OR (=) C3 × B3 + D3 × B3 + D3 × B3 OR (=) (2 × D3 + C3) × B3 OR equivalent	M1 m1 A1 B4 7	Or equivalent method that could lead to 8 Depends on M1. May be embedded CAO A correct answer in the table gets M1, m1, A1 Ignore 'E3 ='. Accept '*' as '×' Award *B3* for sight of C3 × B3 + D3 × B3, or 2 × D3 × B3, or D3 × B3 + D3 × B3, or (2 × D3 + C3) Award *B2* for sight of 'B3×C3' or 'B3×D3' Award *B1* if shown numerically, with an attempt then to use a cell reference *Penalise consistent incorrect row -1 only*
6.(a) 5 | 4 and 2 | 5 only (with no other entries) (b) (c) Shows understanding that the pie charts don't show how many phones were sold	B2 B4 B1 7	B1 for either entered correctly *<u>FT their **2** entries, or 'nil entries', or if **1** extra entry to mark (b)</u>. However if responses in (b) are correct then award marks as appropriate* Median, mode and range correct, OR B3 for 4 or 5 correct entries B2 for 3 correct entries B1 for 1 or 2 correct entries

	Median in £	Range in £	Mode in £
NewKey	23	40	23
eLime	36	37	31

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Applications Unit 2 January 2013 Higher Tier GCSE		Final
7.(a) (Driftwood) $\frac{68\times36 - 2000}{2000}$ (×100) 22.4(%)	M1 A1	(2448 – 2000)/2000 or 0.224 Accept 22(%) from correct working *If no marks SC1 for an answer of 122(.4%)*
(Grain Bank) 0.1×2000 + 15×146 (= 2390) $\frac{\text{'their 2390'} - 2000}{2000}$ ×100 19.5(%)	M1 m1 A1	(200+2190-2000)/2000 or 0.195 An answer of 19(%) or 20(%) is A0 *If M1 only, then also award SC1 for an answer of 119.5(%), 119(%) or 120(%)*
Other considerations, e.g. reference to time period Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £, % being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	E1 Q W C 2	Accept reasonable ideas, i.e. 'consider other bank terms/rates', 'length of time business will last', 'able to repay the loan each month' QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b)(i) 26.60/3.5 (£)7.6(0) (ii) 26.60/1.3 (£)20.46	M1 A1 M1 A1 12	For an answer of 8.06, implying division by 3.3, award SC1 Accept (£)20.47 Award M1 only for 20.4615...
8. $2f + 3g = 5$ and $3f + 4g = 4$ Method, e.g. equal coefficients Correct first variable Method to find 2nd variable, e.g. substitution Correct second variable	B1 M1 A1 m1 A1 5	FT provided at least 1 correct equation and solving is of equivalent difficulty Allow 1 slip in non-equalised variable $f = -8$ or $g = 7$
9.(a) 34990 / 1.175 × 1.24 36930 (euros) (b) Sight of 1769.5 (mm) Sight of 2007.5 (mm) 2007.5 – 1769.5 (÷2) (One wing mirror) 119(mm) (c) 11.5 × 7.5 × 5.5 474.4(cm^3)	M1 M1 A2 B1 B1 M1 A1 M1 A2 11	(29778.72(34)) Independent of 1st M1 CAO Not FT from M0, M1. A1 for 36925(.617 euros) or if incorrectly rounded to 36920 If M0, M1 also allow SC1 for an answer of 35790 (euros) Or half of this Or half of this Must FT from correct working A1 for 474.375 rounded or truncated, but not to 1dp as required An answer of 472.4699… comes from 11.49, 7.49 and 5.49 which is M0, A0, A0
10.(a) 2.0×10^4 (b) 1.1×10^5	B2 B2 4	B1 for 2×10^4 or $1.9(984) \times 10^4$. B1 for $1.(05191) \times 10^5$
11. Opposite = Tan56°× 19 = 28.168658….(m) Height of the tree = 29.968658…(m)	M2 A1 A1 4	M1 for tan56° = opposite/19 Accept rounded or truncated from working Accept rounded or truncated from working, and FT from their rounded or truncated 28.168…

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Applications Unit 2 January 2013 Higher Tier GCSE		Final
12.(a) $t + f \leq 30$ and $3t + 4f \geq 80$	B3	B2 for $t+f \leq 30$ and $3t+4f \ldots 80$, or $t+f \ldots 30$ and $3t+4f \geq 80$, or $t+f < 30$ and $3t+4f > 80$ B1 for either inequality correct, or $t+f \ldots 30$ and $3t+4f \ldots 80$ FT their inequalities if possible provided similar level of difficulty
(b) Line $t+f=30$ drawn correctly	B1	
Line $3t+4f=80$ drawn correctly	B1	
The region indicated	B1	FT from 2 lines with at least one line drawn correctly
(c) Any correct point from the correct region, using whole numbers only	B1 7	OR FT their graph for whole number solutions only
13.(a) Calculation that would lead to a correct answer for TOTAL 2009, 2010, 2011 and 2012	M1	Calculations are: 2009: 2300 2010: 2300×3 2011: 2300×3×3 2012: 2300×3×3×3
92000 (T-shirts)	A2	A1 for correct answer for 2009, 2010, 2011 & 2012 as 2300, 6900, 20700, 62100 T-shirts SC1 for an answer of 6900, 20700 or 62100 T-shirts only *Treat starting with 2009 as 2300×3 and continuing with appropriate pattern of trebling as MR-1 and mark accordingly*
(b) Idea that 3.60 is 112% of previous year price	B1	
$3.60 \div 1.12^3$	M2	M1 for equivalent of $3.60 \div 1.12$
(£)2.56	A1	
(c) Strategy to use quadratic similarity	S1	This may be linear or cubic *The following answers imply S1:* *for linear, 6.468 or 6.46 or 6.47* *for cubic, 12.677 or 12.67 or 12.68*
Sight of 50^2 with 70^2, or 5^2 with 7^2, or 1.4^2, or $(5/7)^2$	M1	
$(4.62/50^2)\times70^2$ or equivalent	A1	
(£)9.06	A1 11	Accept (£)9.05(52)
14.(a) Area of 5 faces of the cuboid 2304 (cm^2)	B1	(144+ 540+ 540+ 540 + 540 = 2304)
Slant height$^2 = 18^2 + 6^2$ (=360)	M1	Or alternative complete method
Slant height = 18.97…. or 19(cm)	A1	
Area 1 triangular face = ½ ×12×'slant height' (=113.84..)	M1	FT for their 18.97, provided not 18
OR 4 triangular areas (= 455.36798…)	A1	Rounded or truncated
Total area 2759.36798…(cm^2)	B1	FT provided includes 'their area of 4 triangles' and 'their total area of rectangles' only if at least 4 rectangles have been considered *Allow rounding or truncation errors if method clear, however if consistent rounding or truncation errors then penalise PR-1*
(£0.045 × Total area =) (£) 124.17		
(b) Appropriate sketch (may be implied) with realisation that 1st step is to find the height/length of the cylinder, then subtraction from 22 will give the height of the cone	S1 M1 A1	
$\Pi \times 6^2 \times$ height of cylinder = 1018	M1	FT '22 – their height of cylinder'
Height of the cylinder 9(.00..cm)	A1	
Volume cone = $1/3 \times \Pi \times 6^2 \times$ (22- height of cylinder)	A1	CAO from correct working
Volume cone, answers in range 489.8 to 490.3 (cm^3)	12	
Overall volume1.5 (litres)		

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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, 21 June 2012

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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 ***3(a)***.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**7**	
2	**7**	
3	**10**	
4	**15**	
5	**5**	
6	**10**	
7	**5**	
8	**6**	
9	**6**	
10	**6**	
11	**7**	
12	**10**	
13	**6**	
TOTAL MARK		

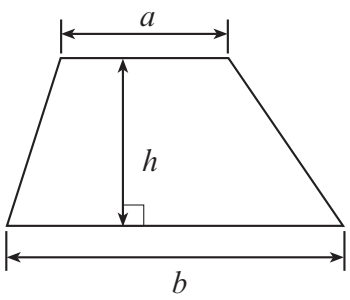
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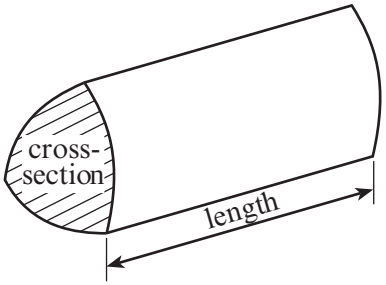
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Formula List

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

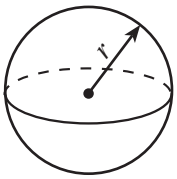


Volume of prism = area of cross-section × length



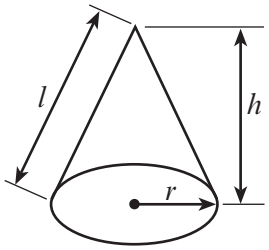
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl

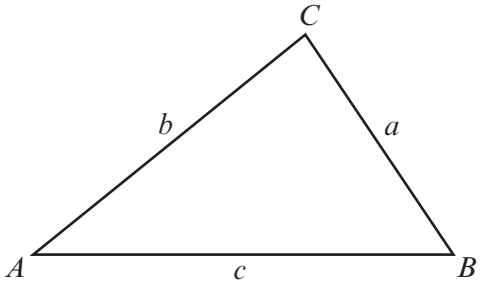


In any triangle ABC

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

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

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1.

Imperial units:	**Metric to Imperial units:**
1 stone = 14 pounds (14 lb) 1 pound (1 lb) = 16 ounces (16 oz)	1 kg is approximately 2.2 lb

Use the information given above to answer the following questions.

(a) Jack weighs 122 lb. Find how much Jack weighs in stones and pounds.

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.....

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..... stones ..... pounds

[3]

(b) Wayne weighs 10 stone 4 lb. Find how much Wayne weighs in kg.

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[4]

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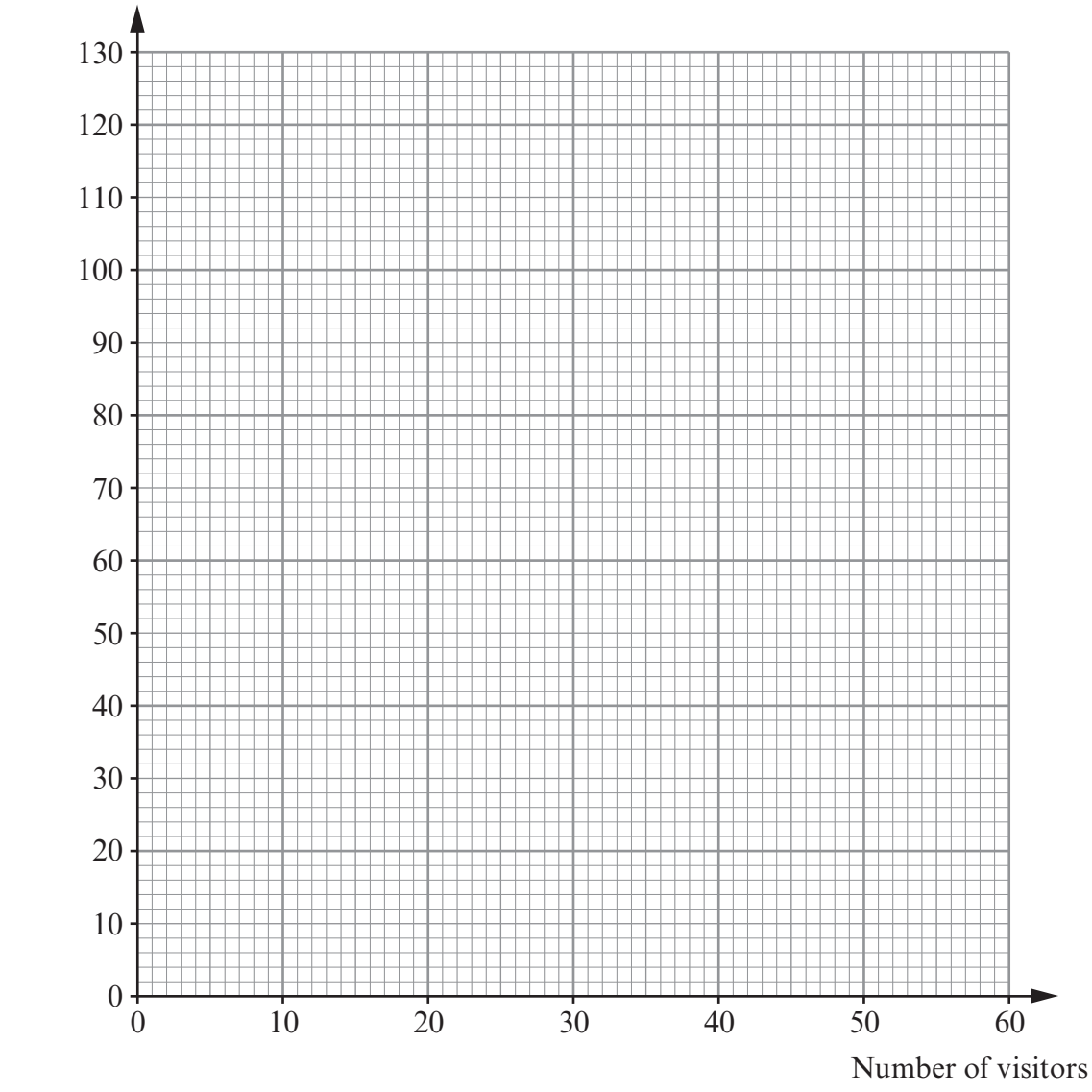
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2. The number of visitors to an animal rescue centre and the total donations received were recorded every day for 7 days.
The table below shows the results.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of visitors	40	10	16	30	25	55	12
Total donations, in £s	90	28	46	70	62	120	100

(a) On the graph paper provided, draw a scatter diagram of these results.

[2]



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

(c) Describe the correlation between the number of visitors and the total donations.

.....

[1]

(d) Which particular day does not fit the correlation?

.....

[1]

(e) The animal rescue centre is given a target to raise £100 a day on each of the next 5 days. The manager says this should be possible just by making sure that they advertise and get 50 visitors a day.

The number of visitors on each of the next 5 days were as follows:

62, 55, 51, 52, and 58.

Can the manager be sure of achieving her target of £100 per day in total donations? You must give a reason for your answer.

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[2]

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

Henry lives in France and is going on holiday to Iceland.
The bank offers him an exchange rate of 1 euro to buy 154.18 Icelandic krona.
Henry wants to exchange 300 euros, but no more than this, into Icelandic krona.
The bank only has 20 krona notes.
Calculate the maximum number of Icelandic krona that Henry can buy and also how much this is going to cost him in euros.

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[7]

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(b) International exchange rates are published every day.
On a particular day in April 2012, the following information was published.

1 Mexican peso is worth 0.082 Canadian dollars

1 Mexican peso is worth 0.058 euros

Use these same rates of exchange to complete the following statements.

1 Canadian dollar is worth ..... euros

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1 euro is worth ..... Canadian dollars

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[3]

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4.

Maple Beech Furniture Store
Fantastic discounts available!
Ask our sales personnel for details

A large furniture store decides to offer various discounts.

Sales personnel are given the following instructions:

- When a customer's total spend is less than £400, then offer a 6% discount.
- When a customer's total spend is £400 or more, then offer a 12% discount.
- After calculating the discount, if a customer is buying more than one item, then offer a **further** 2% discount on the **already discounted price**.

(a) Construct a flowchart to show the most efficient process of giving discounts.

[6]

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(b) Calculate how much these customers would pay when buying the following items from Maple Beech Furniture Store.

(i) Ms Johnson buys a bed for £350.

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[3]

(ii) Mr Grange buys 4 chairs for £160 **each**, and a table for £450.

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[6]

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5. *(a)* A survey was carried out to find the mass of each member of a gym who uses a rowing machine.
The stem and leaf diagram shows the results of the survey.

Women		Men
	9	0
	8	2 3
3	7	1 4 6 8 8
8 3	6	7 8
7 1 1	5	

Key: Women 3 | 7 means 73 kg
Men 6 | 7 means 67 kg

(i) Complete the following table.

	Median in kg	Range in kg	Mode in kg
Women			
Men			

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[3]

(ii) Debbie states,

"In general the men weigh more than the women".

What statement can be made about the spread of the data?

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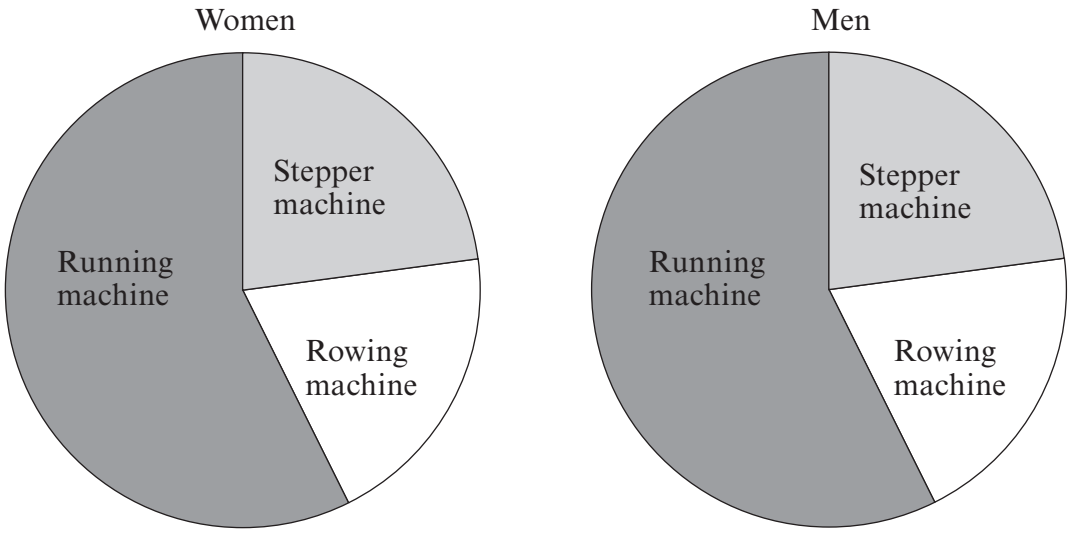
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[1]

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(b) The same men and women were asked, whilst at the gym, how much time they spent on each of three fitness machines, the rowing machine, the stepper machine and the running machine.
The gym instructor produced the following pie charts to display the results of this survey.



Tomas states,

"Men and women at the gym spend the same time on each of the three machines as each other".

Give a reason why Tomas may be wrong.

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[1]

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Examiner only

6. *(a)* Michelle works in a research unit.
Michelle is asked to write readings taken from various experiments in standard form, correct to two significant figures, for a science publication.

Complete the table below.

Experiment	Readings	Standard form, two significant figures
A	34 780 000 000	
B	0·0008249	
C	$(3{\cdot}2 \times 10^{-5}) \div (7{\cdot}8 \times 10^{8})$	

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[5]

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Examiner only

(b) Marc also works in the research unit.
He has been asked to complete a table to give lower and upper bounds for calculations that others have made.
Complete the table below to give the lower and upper bounds for the perimeter and area of a rectangle.

Show your workings using the lines below the table.

Rectangle			
Length	Width	Perimeter	
10 cm correct to the nearest cm	8 cm correct to the nearest cm	Lower bound	Upper bound
		..... cm	..... cm
Length	Width	Area	
10 cm correct to the nearest cm	8 cm correct to the nearest cm	Lower bound	Upper bound
		..... cm^2	..... cm^2

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[5]

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7. Gemma is taking part in a sponsored run.
The first section of her run is uphill.



(a) Gemma has set herself a target to meet.
In order to meet her target she needs to run the first 1·2 miles uphill section in 9 minutes.
Calculate the average speed at which she needs to run in order to meet her target.
Give your answer in miles per hour.

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[2]

(b) The last section of Gemma's run, from the highest point, is 2·6 miles downhill.
The vertical drop in height, from the highest point on the route to the finish is h miles.
The angle of elevation from the finish to the highest point is 11·2°.

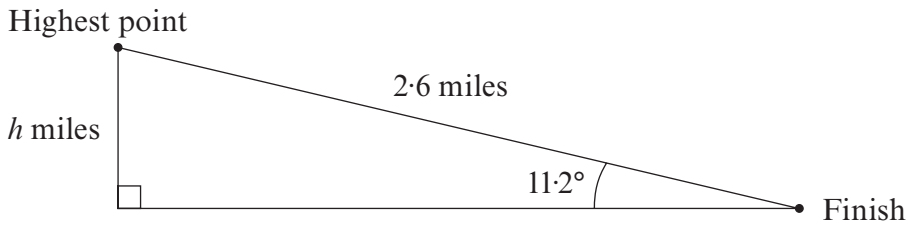


Diagram not drawn to scale

Calculate the vertical drop h.

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[3]

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8. A shop sells thin edging strips to place around rectangular tiles.
The cost of edging a tile on display is £10.
The cost of edging a tile that is three times as long and twice as wide as the tile on display is £27.
Calculate the cost of the edging along each length and along each width of the tile on display.
You must use an algebraic method.

Cost of edging each length £ .....

Cost of edging each width £ .....

[6]

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9. A company that manufactures cones, prints this diagram in their catalogue.

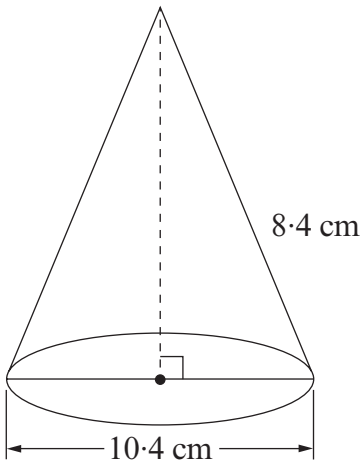


Diagram not drawn to scale

The company receives a request from a customer asking for the volume of the cone.
Calculate the volume of the cone shown, which has a diameter of 10·4 cm and a slant height of 8·4 cm.

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[6]

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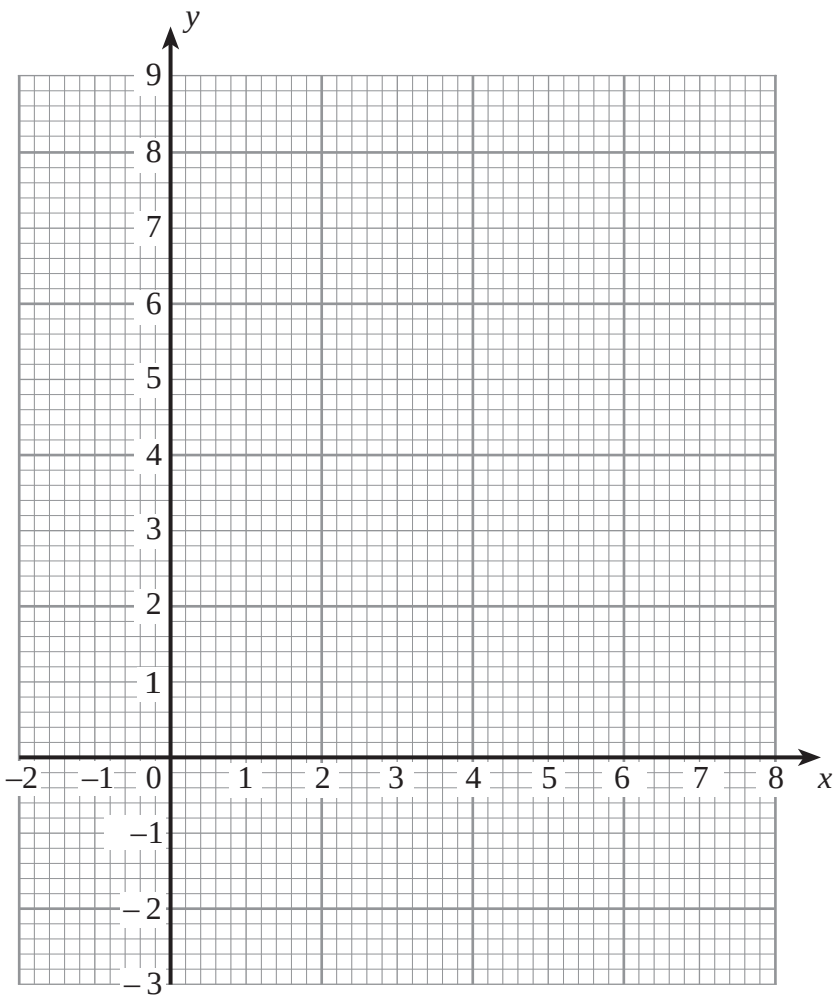
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10. Find the values of x and y that maximise the value of $x + y$, subject to the following constraints.

$$\begin{aligned} x &\geqslant 0 \\ y &\geqslant 0 \\ 5y &\geqslant 7x - 14 \\ x + 2y &\leqslant 14 \\ 3x + 2y &\leqslant 18 \end{aligned}$$

[6]



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Turn over.

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11. *(a)* A particle loses half of its mass every second.
Its initial mass is 100 grams.

(i) Use the graph paper opposite to show the decreasing mass during the first 8 seconds.

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[3]

(ii) After how many seconds will the mass be 5 grams?

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[1]

(b) A particle has an initial mass m grams.
Its mass halves every second.
Write down a formula for finding the final mass, f grams, of the particle after t seconds.

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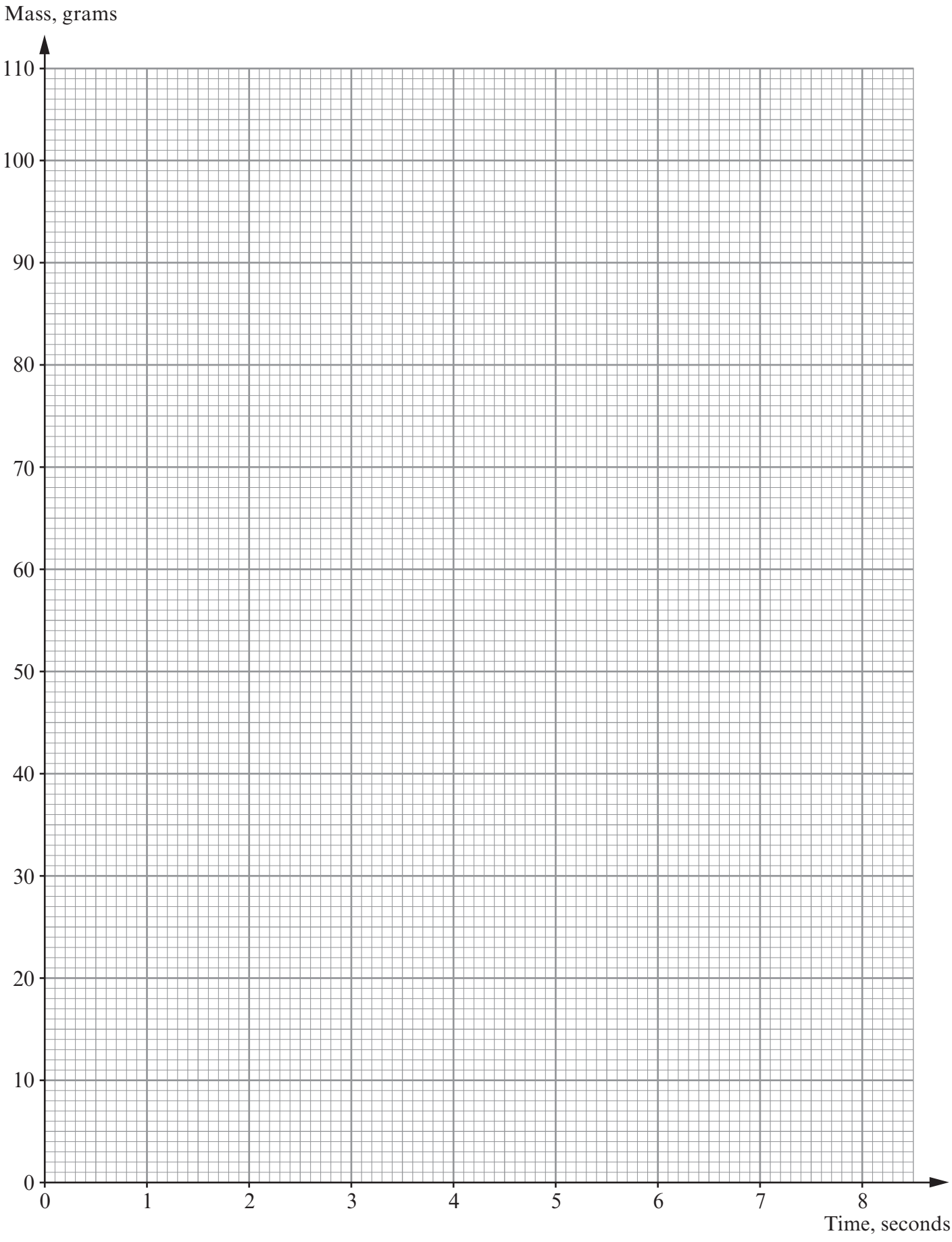
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[3]

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Examiner only

12. Adam is interested in opening a savings account at Morris Bank.
The manager of Morris Bank explains to Adam that they have two different savings accounts.
Some details of the accounts are shown below.

Account	Nominal interest rate	AER Annual Equivalent Rate, correct to 2 decimal places
Quarter Back	8·6% p.a., paid quarterly	.....%
Monthly Goal	5·4% p.a., paid monthly	5·54%

(a) (i) In the table above, complete the AER column in the table for the Quarter Back account using the information given below.

AER, as a decimal, is calculated using the formula $(1 + \frac{i}{n})^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

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[5]

(ii) Explain why AER is used by the bank.

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[1]

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(b) Adam decides to invest £350 in the Monthly Goal account for 3 years.
The account pays an AER rate of 5·54% p.a.
Will Adam have sufficient money in his Monthly Goal account to buy a motor scooter for £410 in 3 years time?
You must show all your working and give a reason for your answer.

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[4]

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13. The diagram shows a circular flower bed, which is split into two sectors, one for spring flowers and the other for roses.
The centre of the circle is O and the area of the minor sector is 31·3 m^2.

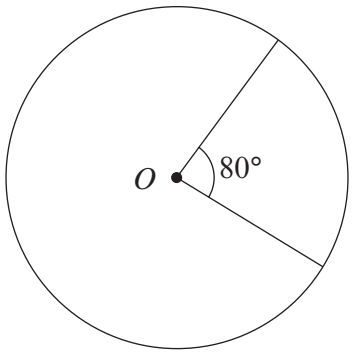


Diagram not drawn to scale

(a) Calculate the radius of the flower bed.

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[3]

(b) Calculate the perimeter of the major sector of the flower bed.

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[3]

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 2 (FOUNDATION TIER)

Applications Unit 2 Foundation June 2012		FINAL
1. (a) (i) 10.5(0) 19.96 34.75 73.1(0) (ii) $\frac{10}{100}$ × 'their 73.1(0)' (£)7.31 ISW (iii) Actual cost of goods (£)65.79 80 – 'their 65.79' (£)14.21 (b) 20 ÷ 1.39 (14.388..) Buys 14 plants Change = 54(pence) or (£)0.54	B1 B1 B1 B1 M1 A1 B1 M1 A1 M1 A1 A1 12	FT for 1 error. B0 for 73.01 FT their total from(i) (£)65.79 may be seen in (ii). FT their 65.79 Use of 0.388… to calculate change A0 for £54 or 0.54p. Accept £0.54p *For use of 10% discount:* *M1 20 ÷ their cost of a plant* *A1 number of plants bought* *A1 Change given.* *For final A1 a correct 10% value must be used.*
2.(a) (i)Litres Km (ii) Kg or Stones or pounds (b) a = 9 b = 11 c = -3	B1 B1 B1 B1 B1 B1 6	Accept m^3 Accept pounds, lbs or stones and pounds FT their a FT their a and b

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Applications Unit 2 Foundation June 2012		FINAL
3.(a) 8 × 6.50 (£)52	M1 A1	
(b) (6.50 × 2 × 5 (£)65	M2 A1	Award M1 for either 6.5(0) × 2 or 6.5(0) × 5 OR Award M1 5 × 2 = 10 hours M1 10 × 6.5(0) A1 (£)65
(c) earnings (32 × 6.50=) (£)208 Tax &NI (1/10 of 208=) (£)20.8(0) Total outgoings (20.8(0) + 50 + 60=) (£)130.8(0) Has left (208 – 130.8(0)=) (£)77.2(0) Number of weeks (439 ÷ 77.2(0)= 5.68...) 6 weeks needed	B1 B1 B1 B1 B1	CAO FT their 208 FT their 20.8(0) FT their 130.8(0) FT their 77.2(0) <u>Alternative method</u> Earnings = 208 **B1** Tax = 20.80 **B1** (208 – 20.80 =)187.20 **B1** Has left 77.20 **B1** FT 187.20 – 50 - 60 Number of weeks = 6 weeks **B1** FT their 77.2(0)
For QWC Look for • spelling • clarity of text explanations • the use of notation (watch for the use of '=', '£' being appropriate) Notes: QWC2 requires words throughout the response not just connected to the final answer. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	Q W C 2	*If no tax & NI Award* *B1 for 208, B0, B0, B1 for (208 – 110 =) 98, B1 for (439 ÷ 98=) 5 weeks* QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
	12	
4.Use of height of man 2m or 6 feet Scale factor 8 16m or 48ft	B1 B1 B1	Accept range of 1.5m – 2m or 5ft – 6 ½ft Award B1 if boat subdivided into 8 parts. FT their scale factor if in range 6 – 9 × their height. *For final B1 units of metres or feet must be included.* *Award B3 For unsupported answers in the range 12m – 16m or 40ft – 52ft. Units must be given.*
	3	

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Applications Unit 2 Foundation June 2012		FINAL
5.(a) Labels on both axes Uniform scale on vertical axis All bars correct	B1 M1 A1	 Bars must have correct heights and equal widths
(b) 1 | 5 8 8 2 | 3 4 8 8 3 | 1 7 9 4 | 2 9 5 | 2 6 6 | 8 Key eg. 5/6 represents 56	B2 B1	-1 for each error Award SC1 for a correct stem and leaf diagram but not ordered
(c) 3 or 4 angles correct and correctly labelled. OR 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR <u>If 0 OR 1 for their diagram or no diagram.</u> 360/120 Angles are 84, 93, 111, 72.	B4 OR (B3) (B3) (B2) (B1) (M1) (A1) 10	Use the correct overlay and allow ±2°. Correct labels (Words NOT the frequency OR angle) 3 correct labels are enough. If only B1 is scored for the diagram and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 3° gets the M1 OR SC1 for all the correct percentages 23.3%, 25.8%, 30.8%, 20%
6. $6 \times 45 = 270$ (mins) 4 hours = $4 \times 60 = 240$ (mins) or 270 (mins) = 4 ½ (hours) No because she needs 30 mins more	B1 B1 E1 3	*Alternative method* *2 programmes = 1 ½ hours* *4 programmes = 3 hours* *6 programmes = 4 ½ hours* Accept "no because there isn't enough time" or "can watch 5 episodes (and 15 mins of 6th)" *Penalise -1 for incorrect use of hours and minutes for final E1*
7. (a) $^4/_{10}$ (ISW) or $^2/_5$ (b) knowing that 3 parts represent 24 mins $24 \div 3 = 8$ 10×8 = 80 (mins) or equivalent	B2 B1 M1 M1 A1 6	B1 for denominator of 10 (5) or B1 for numerator of 4 (2) in a fraction less than 1.

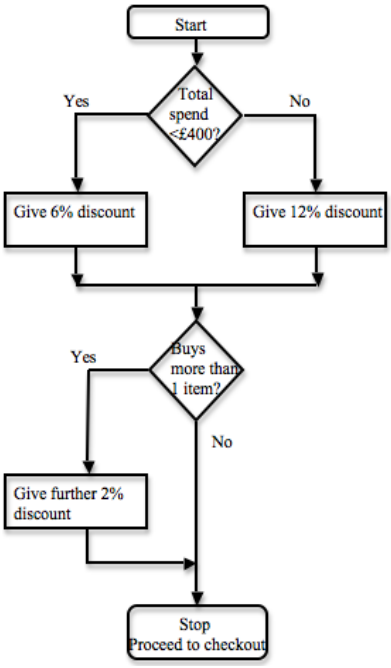
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Applications Unit 2 Foundation June 2012		FINAL
8. Area of whole = 38.5^2 = 1482.25 One Dimension of green = 35.5 Area of green = (35.5^2) 1260.25 Area of path 1482.25 – 1260.25 = 222 square metres <u>Alternative method 1</u> M1 38.5 × 1.5 M1 35.5 × 1.5 A1 for either 57.75 or 53.25 B1 for both 115.5 and 106.5. M1 115.5 + 106.5 A1 222 square metres <u>Alternative method 2</u> M1 38.5 × 1.5 (= 57.75) A1 (57.75 × 4 =) 231 M1 1.5 × 1.5 (= 2.25) A1 (2.25 × 4 =) 9 M1 231 – 9 A1 222 square metres	M1 A1 B1 B1 M1 A1 6	 FT their 1482.25 – their 1260.25 FT their 2 × 57.75 and 2 × 53.25 FT provided M1, A1 and B1 awarded FT provided both M marks awarded and one A mark
9.(a) All 7 points plotted correctly, not joined (b) Reasonable straight line of best fit by eye, some points above and below (c) Positive (d) Indicates Sunday (12, 100) (e) No with a reason based on risk, not really a secure relationship between what people give and how many	B2 B1 B1 B1 E2 7	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined Accept appropriate descriptions E1 for No with statement such as ‘people only gave £1 each’

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Applications Unit 2 Foundation June 2012		FINAL
10.(a) Correct flowchart with appropriate symbols Accept equivalent ways of describing the discounts (or equivalent using $\geq$ **400** with reverse initial decisions) For example,  	B6	Ignore if start/stop rounded rectangle and input parallelogram missing. Accept shapes not drawn using a ruler. Mark as follows: B1 Shape of boxes –All decision boxes shown as rhombus, all non-decision boxes as (intention) rectangle B1 for correct use of **<400** or in words "less than 400" within a flowchart, or equivalent *Accept if $\leq$ or < written or implied as appropriate* B1 Yes/No with actions for initial discounts correct B1 Bringing back together ready for next consideration as single flow *FT if now two separate flows* B1 Question(s) relating to more than 1 item AND Yes/No with action for discount B1 Finish indicated, e.g. "proceed to checkout", accept as two separate flows
(b)(i) Selects 6% discount only & no further discounts 350 - 0.06 × 350 or 0.94 × 350 or equivalent (£)329	S1 M1 A1	Indication of 6% may be with incorrect notation
(ii) 4 × 160 + 450 (£)1090 1090 × 0.88 or equivalent (£)959.2(0) 959.2(0) × 0.98 (£)940(.016)	M1 A1 M1 A1 M1 A1	FT their 1090 FT their 959.2(0) May be embedded answers leading towards a final response Accept 940, 940.01, 940.02, 940.016 *If 1 chair and a table then:* *(M0 160 + 450)* *(A0 = (£)610)* *M1 610 × 0.88 (FT their 610)* *A1 = (£)536.8(0)* *M1 536.8(0) × 0.98 (FT their 536.8(0)* *A1 = (£)526(.064)* *Treat starting with 4 chairs or 1 table as above with FT, however if only 1 table no 2% discount should be awarded marks, hence maximum, M0, A0, M1, A1, M0, A0* *No marks for working with 1 chair only* *Candidates working with discount of 14%, possible M1, A1 for (£)1090, then SC1 for (£)937.4(0), allow FT from their (£)1090*
	15	

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UNIT 2 (HIGHER TIER)

Applications Unit 2 Summer 2012 Higher Tier		FINAL
1.(a) 122 ÷ 14 8 (stone) 10 (pounds) (b) 10 × 14 + 4 144 (pounds) 144 ÷ 2.2 65 (kg) or 65.5 (kg)	M1 A2 M1 A1 m1 A1 7	Or for repeated addition or subtraction of 14, at least 6 correct calculations A1 for 8.7(142…) with an attempt to work with the decimal, or sight of 112. M1, A0 for 8.7(142…) or 8 stone 7lb The "+4" may be embedded in further calculation May be implied in later calculation FT provided M1 awarded Accept 65.4(545…) *Conversion of 4lb to a decimal (0.2857…)leads to a difference in final answer, penalise PR-1* *SC1 for an answer of 66.18.. or 66.2 or 66 (from 10.4×14÷2.2), OR for an answer of 63.6(33…) (from 10×14÷2.2)*
2.(a) All 7 points plotted correctly, not joined (b) Reasonable straight line of best fit by eye, some points above and below (c) Positive (d) Indicates Sunday (12, 100) (e) No with a reason based on risk, not really a secure relationship between what people give and how many visitors	B2 B1 B1 B1 E2 7	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined Accept appropriate descriptions E1 for No with statement such as 'people only gave £1 each'

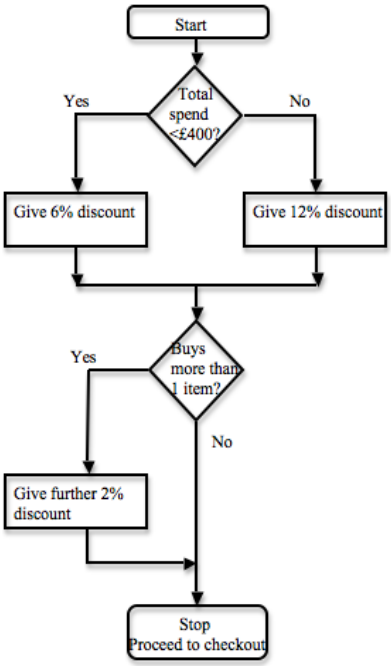
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3.(a) 300 × 154.18 46254 (krona) Need to buy 46240 (krona) 46240 ÷ 154.18 299.91 (euros) Look for • spelling • clarity of text explanations, • the use of notation and units (watch for the use of '=', euro, krona being appropriate) QWC2 can only be awarded if 'krona' is stated appropriately in working, and 'euro' in a final answer QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 A1 M1 A1 QWC 2	FT 'their 46240' but not 300 or 46254 An answer of 299.9(0) is M1, A1, A1, M1, A0 QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b) 0.082 Canadian Dollars = 0.058 euros, linked with either appropriate calculation required 0.7073… euros, rounded or truncated 1.41379… Canadian Dollars, rounded or truncated	M1 A1 A1	May be implied by 1 correct answer *Do not award M1 if answers are reversed* 1÷0.082 (= 12.195122…) × 0.058 = 0.707… 1÷0.058 (=17.241379…) × 0.082 = 1.41379… *Penalise premature truncation or rounding errors -1 only, and only if their answer would be different to 0.70, 0.71 and 1.41 if truncated or rounded* *If a place value error is repeated in (b), due to use of, for example 0.58 or 0.82, then penalise once only* *M1 may be implied by answer from premature approximation*
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4.(a) Correct flowchart with appropriate symbols Accept equivalent ways of describing the discounts (or equivalent using $\geq$ **400** with reverse initial decisions) For example,  	B6	Ignore if start/stop 'rounded rectangle' and/or input/output parallelogram missing. Accept shapes not drawn using a ruler. Mark as follows: B1 Shape of boxes –All decision boxes shown as rhombus, all non-decision boxes as (intention) rectangle B1 for correct use of **<400** or in words "less than 400" within a flowchart, or equivalent *Accept if ≤ or < written or implied as appropriate* B1 Yes/No with actions for initial discounts correct B1 Bringing back together ready for next consideration as single flow *FT if now two separate flows* B1 Question(s) relating to more than 1 item AND Yes/No with action for discount B1 Finish indicated, e.g. "proceed to checkout", accept as two separate flows
(b)(i) Selects 6% discount only & no further discounts 350 - 0.06 × 350 or 0.94 × 350 or equivalent (£)329	S1 M1 A1	Indication of 6% may be with incorrect notation
(ii) 4 × 160 + 450 (£)1090 1090 × 0.88 or equivalent (£)959.2(0) 959.2(0) × 0.98 (£)940(.016)	M1 A1 M1 A1 M1 A1	FT their 1090 FT their 959.2(0) May be embedded answers leading towards a final response Accept 940, 940.01, 940.02, 940.016 *If 1 chair and a table then:* *(M0 160 + 450)* *(A0 = (£)610)* *M1 610 × 0.88 (FT their 610)* *A1 = (£)536.8(0)* *M1 536.8(0) × 0.98 (FT their 536.8(0)* *A1 = (£)526(.064)* *Treat starting with 4 chairs or 1 table as above with FT, however if only 1 table no 2% discount should be awarded marks, hence maximum, M0, A0, M1, A1, M0, A0* *No marks for working with 1 chair only* *Candidates working with discount of 14%, possible M1, A1 for (£)1090, then SC1 for (£)937.4(0), allow FT from their (£)1090*
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5.(a)(i) (ii) Statement, e.g. 'greater spread for the men (than the women)', or 'very similar' (b) Reason that includes reference to the fact that cannot tell how much time was spent	B3 E1 E1 5	B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries Accept 'more higher weights for men', 'the difference in the range is (only) one' Do not accept 'there are more men than women', without further clarification related to not knowing the time spent
6.(a) 3.5×10^{10} 8.2×10^{-4} 4.1×10^{-14} (b) Evidence of 9.5, 10.5, 7.5, 8.5 Perimeter Lower **34** (cm) Upper **38** (cm) Area Lower **71.25** (cm^2) Upper **89.25** (cm^2)	B2 B2 B1 B1 B4 10	B1 for $3.4(78) \times 10^{10}$ B1 for $8.24(9) \times 10^{-4}$ CAO *Penalise once, on the first occasion, only for consistent incorrect notation* May be implied by 3 correct answers in the table In upper bounds accept $0.49^{\cdot}$ or 0.49 recurring B1 for each correct entry Accept 71.3 and 89.3, for 71.25 and 89.25 respectively from evidence of correct bounds *Also possible SC1for appropriate use of values in the range 10.4 to 10.49.. **and** 8.4 to 8.49.., e.g. for sight of 37.6 for upper perimeter and 87.36 or 87.4 for upper area from use of 10.4 and 8.4*
7.(a) Speed = $\frac{1.2}{9/60}$ or equivalent 8 (mph) (b) $h = \sin 11.2(°) \times 2.6$ $= 0.5(05\ldots)$	M1 A1 M2 A1 5	or 1.2/0.15 CAO M1 for $\sin 11.2(°) = h/2.6$ Mark final answer
8. Strategy: attempt to set up simultaneous equations with clear indication of the variables, e.g. on diagrams $2x+2y=10$ with $6x+4y=27$, or equivalent Equating coefficient (1 slip allowed), One of the variables found Method to find the second variable, using their first variable Second variable	S1 M1 M1 A1 M1 A1 6	May be informal, shown by diagrams. Variables used may be implied later Could be semi-perimeter with correct interpretation later N.B. Any FT from here is for M marks only, accuracy marks for correct answers only FT for $x+y=10$ with $3x+2y=27$, or one of these 2 equations with an appropriate one of $2x+2y=10$ or $6x+4y=27$. FT for one correct equation with another in a similar form. Do not award M1 for a trial & improvement method Do not award M1 for a trial & improvement method Answer of 7 and 3 as a final answer is A0 ***(Length cost) x=(£)3.5(0) and (Width cost) y=(£)1.5(0)*** *Award SC2 for unsupported correct answers, or for correct answers from correct visual interpretation* *$x + y = 10$ and $2x + 3y = 27$ leading to answer of 7 and 3 from a correct method is awarded 3 marks: S1, M0, M1, A0, M1, A0*
9.Strategy: Pythagoras' Theorem and $\Pi r^2 h/3$ $8.4^2 - 5.2^2 = h^2$ $h = 6.596969\ldots$ or appropriately rounded $\frac{\Pi \times 5.2^2 \times h}{3}$ Accept answers 186 (cm^3) to 187(cm^3) inclusive	S1 M2 A1 m1 A1 6	 M1 for $8.4^2 = 5.2^2 + h^2$ Depends on previous M1 or M2. FT 'their height' not 8.4, however if inappropriately truncated then FT for M1 only Must be from correct working, or unsupported

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10. Overall idea, working in the quadrant shown to find a region and technique for solution of the problem	S1	
Any 2 of the lines 5y=7x-14, x+2y=14 and 3x+2y=18 drawn correctly	B2	B1 for 1 line
Correct region identified from all correct lines	B1	CAO. May be implied by further work in maximising
Use of x+y= … OR solution of x+2y = 14 & 3x+2y = 18	M1	FT for their identified region
Maximised when $x = 2$ and $y = 6$	A1 6	FT for their identified region
11.(a)(i) All 9 plots accurate (taking into account accuracy difficulty of plotting after 6.25) AND joined with a curve	B3	B2 for plots generally accurate from 100 to 6.25 with an attempt at the others, but not joined by a curve, OR B1 for points 100 to 12.5 accurately plotted For information: *100, 50, 25, 12.5, 6.25, 3.125, 1.5625, 0.78125, 0.390625*
(ii) From their graph, provided their answer is between 4 and 5 (seconds) **exclusive**	B1	
(b) $f = m/2^t$ or $f = m \times 0.5^t$	B3 7	B2 for expression $m/2^t$, or $m \times 0.5^t$, OR B1 for evidence of m **repeatedly** being divided by 2 or multiplied by 0.5, i.e. more than once, or sight of 2^t or 0.5^t
12.(a)(i) Use of $i = 0.086$	B1	
Use of $n = 4$	B1	
$(1 + 0.086/4)^4 - 1$	M1	Correct substitution in the formula given
AER 8.88(%)	A2	A1 for 0.088(813467……) or incorrect rounding or truncation of the AER percentage
(ii) Explanation, based on need for fair comparison of interest rates	E1	Accept 'percentage of interest paid annually', must mention 'year' or 'annual'
(b) $5.54/100 \times 350$ or 0.0554×350	B1	
$(1 + 0.0554)^3 \times 350$	M1	May be embedded in further calculation Method of adding on different amounts , 3 year period, following attempts to calculate 5.54% (350+19.39=369.39 369.39+20.46(42..)=389.85(42..) 389.85+21.597.. =)
(£) 411.45(21…)	A1	Accept 411.44(7..)) *B1 and SC1 for depreciation 294.99, but no FT*
Conclusion, e.g. Yes as more than £410	E1 10	*Accept 5.4% monthly used instead to give an answer of 411.40(15..)* FT from their compounded amount provided M1, and FT from simple interest for an answer of 408.17 (408.12 from monthly) being < than 410
13.(a) $31.3 = (80/360) \times \Pi \times r^2$	M1	
$r^2 = 31.3/\{(80/360) \times \Pi\}$	m1	
Answers between 6.69 and 6.70 (m)	A1	
(b) $(280/360) \times 2 \times \Pi \times r$	M1	FT 'their r'
Answers between 32.6 and 32.75(m)	A1	
Adding on 13.4 correctly (between 46.0 and 46.15 (m))	A1 6	FT +13.4 provided M1 awarded

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