WJEC GCSE APPLICATIONS OF MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 1 FOUNDATION TIER 4361 PAPERS

STEMUP

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

S16-4361-01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. THURSDAY, 9 June 2016

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.*(a)(b)*	**9**	
2.*(c)*	**5**	
3.	**11**	
4.	**9**	
5.	**5**	
6.	**11**	
7.	**4**	
8.	**3**	
9.	**5**	
10.*(a)(b)(c)(d)*	**11**	
10.*(e)*	**3**	
Total	**80**	

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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.

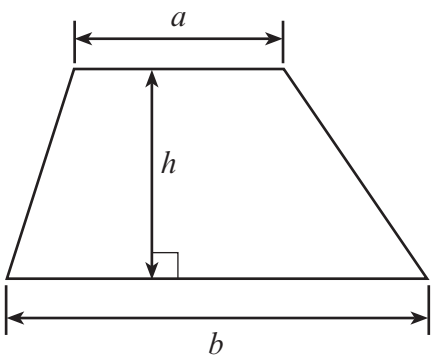
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **4***(b)*.

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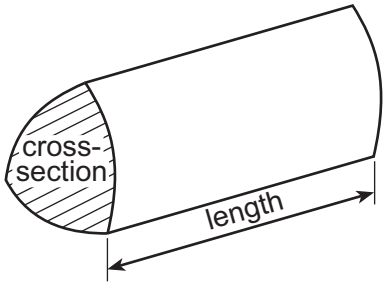
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Formula List

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



Volume of prism = area of cross-section × length



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1. Anwen's phone number has 6 digits.
Anwen remembers her phone number as three lots of 2-digit numbers.



The first 2-digit number is a prime number between 20 and 25.
The second 2-digit number is a square number between 50 and 70.
The third 2-digit number is a factor of 30 that is divisible by 3.

All 6 digits of her phone number are different.

What is Anwen's phone number? [4]

.....

.....

.....

.....

Anwen's phone number is: ....

4

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2. Jim grows potatoes in his garden.



He grows the potatoes by planting seed potatoes during the Spring.

Jim sees an advert in the local gardening magazine.

> 1 kg of seed potatoes costs £1.99
>
> 1 kg of seed potatoes will produce 12 kg of potatoes to eat

Jim decides to buy 15 kg of these seed potatoes.

(a) How much will Jim pay for these seed potatoes? [2]

.....

.....

(b) (i) How many kilograms of potatoes are the seed potatoes that Jim buys likely to produce? [2]

.....

.....

(ii)

> Supermarket offer!
>
> 2·5 kg bag of potatoes for £2

Jim uses all of the potatoes he has grown.
How much is he likely to save by growing his own potatoes rather than buying the same amount of potatoes at the supermarket? [5]

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9

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(c) The part of the garden where Jim grows his potatoes is rectangular in shape.
It has an area of 250 square metres and is 10 metres wide.
Jim needs to buy fencing to go around this part of the garden.
What length of fencing does he need to buy?
State the units of your answer. [5]

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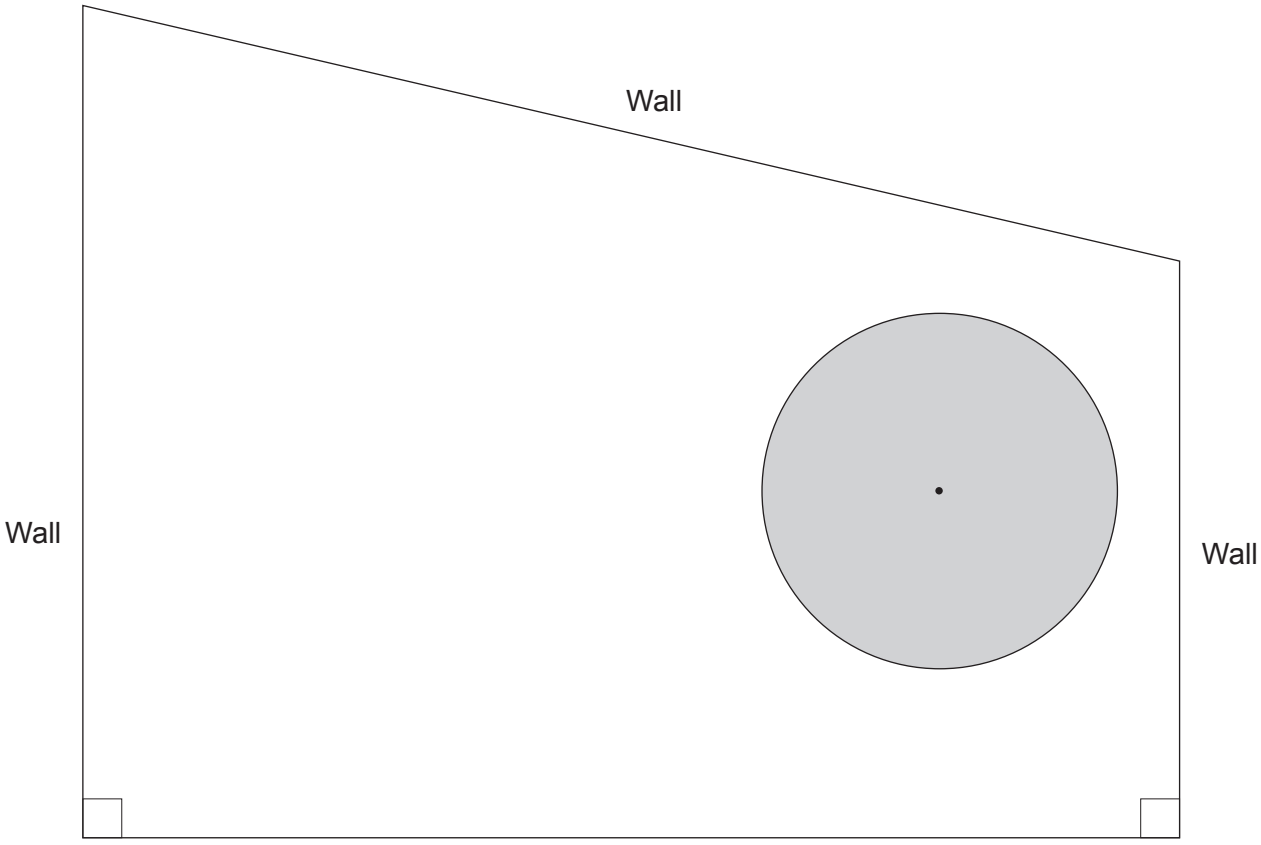
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3. The diagram below is a **scale drawing** of Imran's garden.
The angles in two of the corners are each 90°, as shown.
Imran has a circular pond in his garden.
There is a wall that runs on 3 sides of the garden.

Scale: 1 cm represents 2 metres



(a) What is the diameter of the pond in the scale drawing?

(i) Give your answer in centimetres. [1]

..... cm

(ii) Give your answer in millimetres. [1]

..... mm

(b) Measure the acute angle in the garden. [1]

..... °

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(c) What is the total length of the wall that runs on 3 sides of the actual garden? [4]

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Total length of the wall = ... m

(d) A square flower bed of side 4·6 m is to be placed in Imran's garden.
One of the corners of the flower bed is at *A*.
Draw the flower bed on the scale drawing. [2]

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(e) Imran knows that his garden is shaped as a quadrilateral.
What is the name of the quadrilateral?
Give a reason for your answer. [2]

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11

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4.



A theme park advertises some of its prices as:

Single Tickets	
Standard (ages 13+)	£23
Reduced (see note below)	£16
Under 3s	FREE
Group Tickets	
Group of 4 (2 standard & 2 reduced)	£68
Group of 5 (2 standard & 3 reduced)	£80
Group of 6 (2 standard & 4 reduced)	£92

Note:
Reduced prices are available for all those aged 3 to 12, senior citizens and disabled.

(a) How much will it cost for 2 adults and a child aged 10 to visit the theme park? [2]

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

16 friends want to visit the theme park.
5 of the group are under the age of 13.
All the members of the group are over the age of 3.

What is the cheapest way to buy their tickets?
How much does this cost?

You must show all your working. [7]

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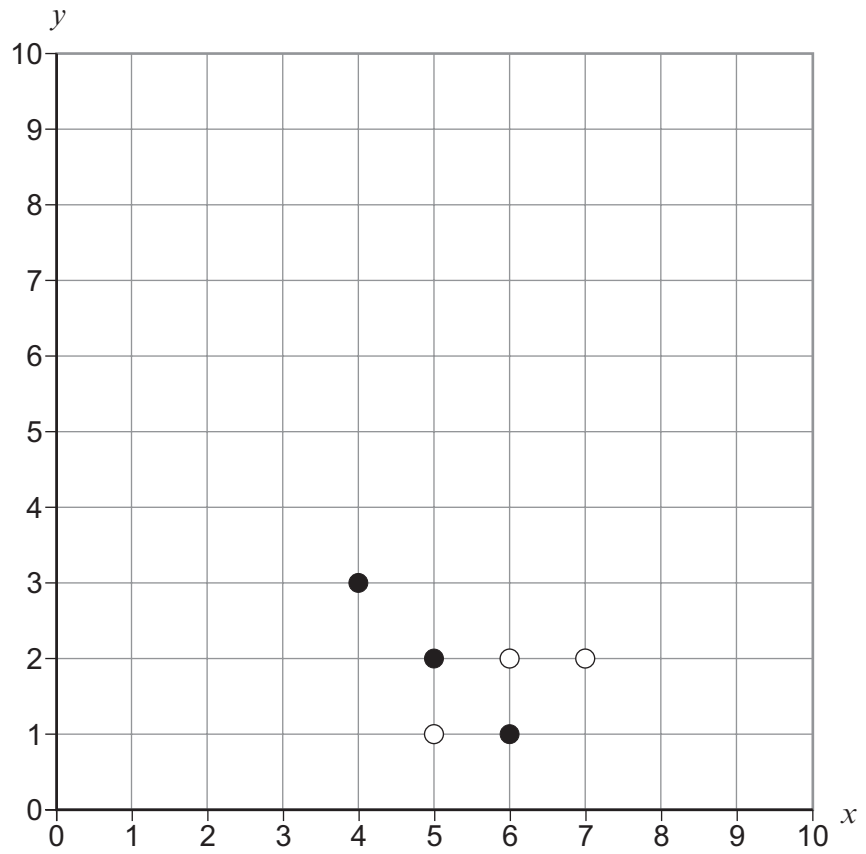
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5. A game for 2 players is played on a grid using coordinates.
One player has white counters ○ .
The other player has black counters ●.

Players take it in turns to place a counter on the grid.
A player wins if they place 4 of their counters next to each other in a straight line, either horizontally, vertically or diagonally.

The players have taken 3 turns each.
The diagram below shows the position of their counters.



(a) The player with the white counters decides to place the next counter at (8, 2).
Draw this counter on the grid. [1]

(b) Where could the next black counter be placed in order to win the game?
Write down the coordinates of the position of this counter. [1]

(..... , ...)

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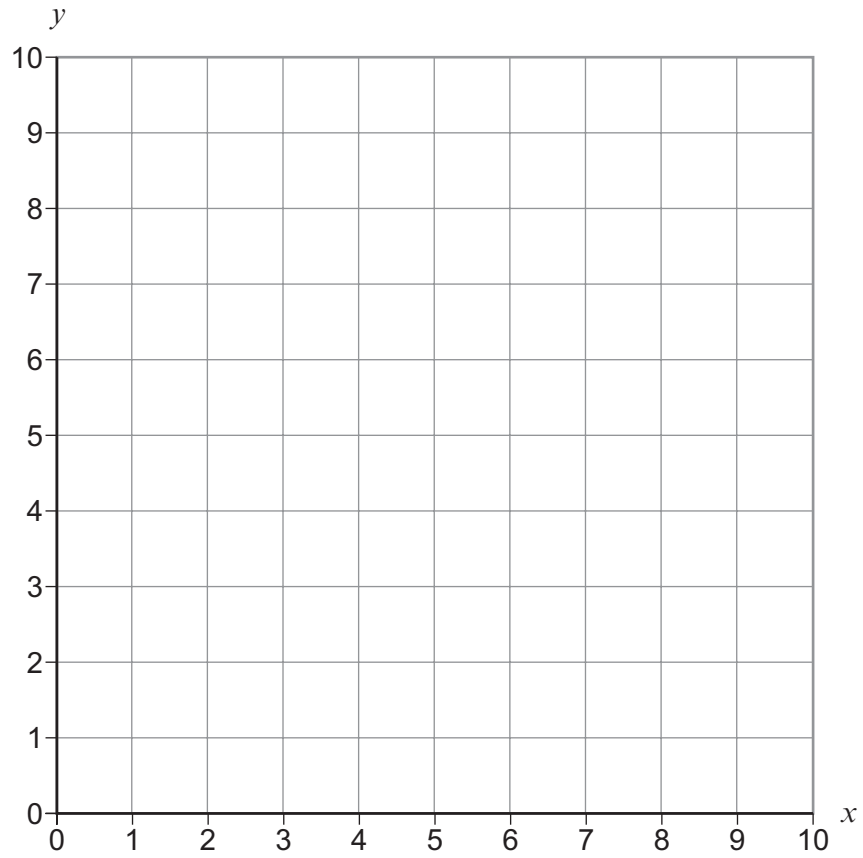
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(c) At the end of another game, the player with black counters notices that all of his counters have been placed in positions where

$$y\text{-coordinate} = x\text{-coordinate} + 4.$$

On the grid below, show all the positions where the black counters could have been placed. [3]



5

Examiner only

6.



(a) At a village fayre, a stall is raising money for charity using a game involving 2 bags of discs.

In each bag there are 5 discs.
In the 1st bag, the discs are numbered 1, 2, 3, 5 and 7.
In the 2nd bag, the discs are numbered 3, 4, 6, 8 and 9.

To play the game, one disc is selected at random from each bag.
The score for the game is the product of the numbers on the discs.

(i) Complete the following table to show all the possible scores. [2]

2nd bag \ 1st bag	1	2	3	5	7
9	9	18			
8	8	16			
6	6	12			
4	4	8	12	20	28
3	3	6	9	15	21

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(ii) You win a prize by getting a score of 12 or less.
It costs £1 to play the game once.
The prize for winning the game is £1.50.
If 200 people play the game once, estimate how much money will be raised for charity. [6]

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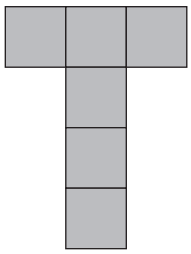
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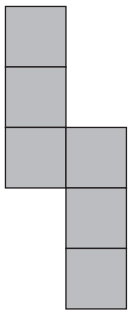
(b) On another stall, a group of children has a game involving rolling an ordinary 6-sided dice.

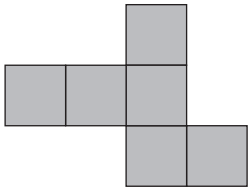
(i) What is the probability of obtaining the number 4 on one roll of this dice? [1]

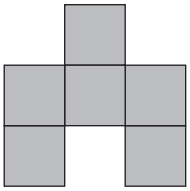
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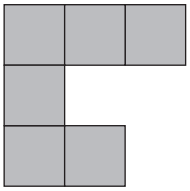
(ii) Circle the nets that could be used for the dice. [2]











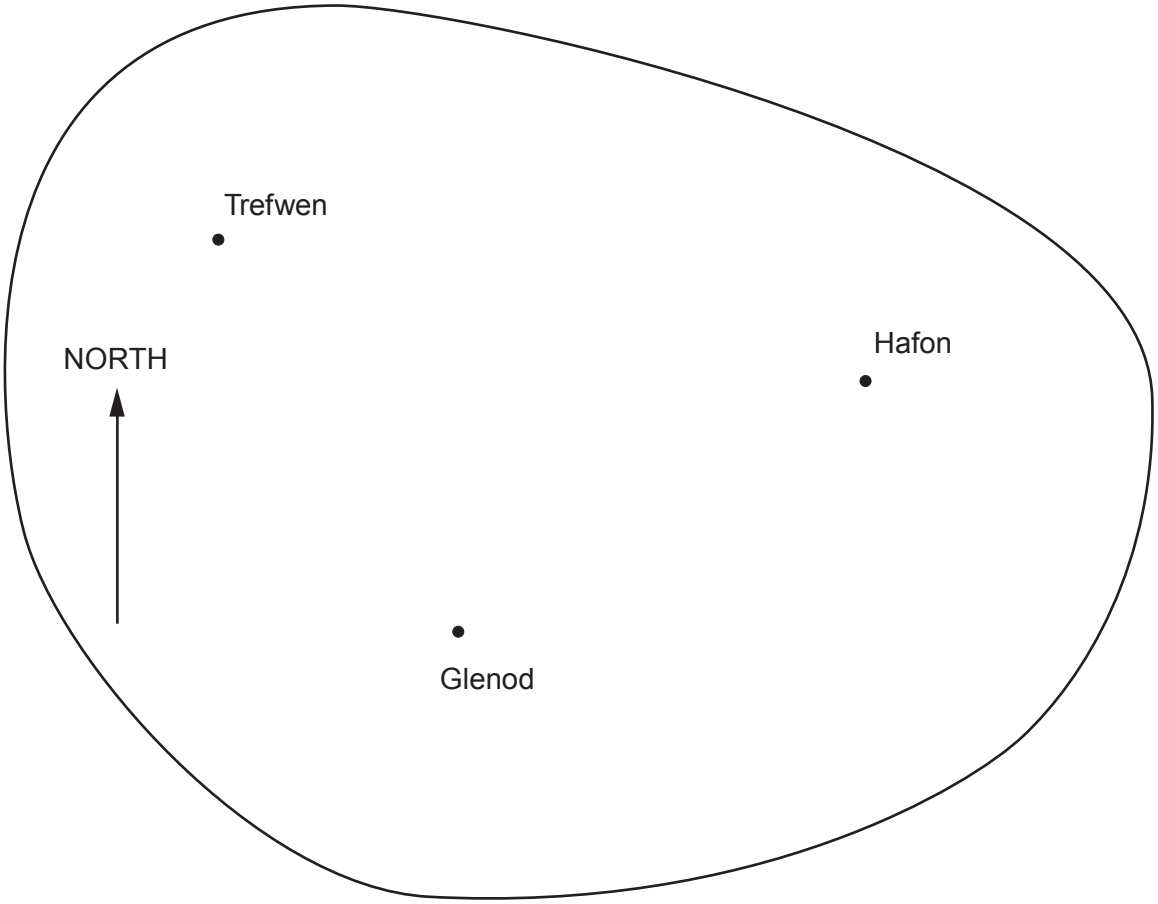
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7. Trefwen, Hafon and Glenod are three castles.
The simplified map below shows the positions of the three castles.



A visitor centre is being built.

The visitor centre is on a bearing 035° from Glenod and on a bearing of 125° from Trefwen.
What is the bearing of the visitor centre from Hafon? [4]

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Bearing of the visitor centre from Hafon is ..... °

4

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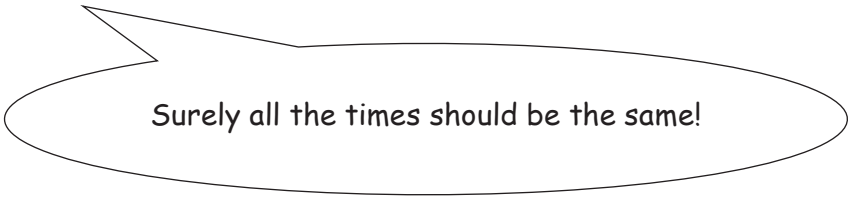
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8. Judy, Trefor and Wyn each time how long it takes for a coin to fall from their classroom window to the ground outside.

Judy's coin takes 1·8 seconds.
Trefor's coin takes 2·4 seconds.
Wyn's coin takes 2·2 seconds.

Their friend Abbie says:



List **3** factors that could play a part in the times not being the same. [3]

1. .....

.....

2. .....

.....

3. .....

.....

3

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9. Alfie sells 480 raffle tickets, at 50p each, to raise money for charity.

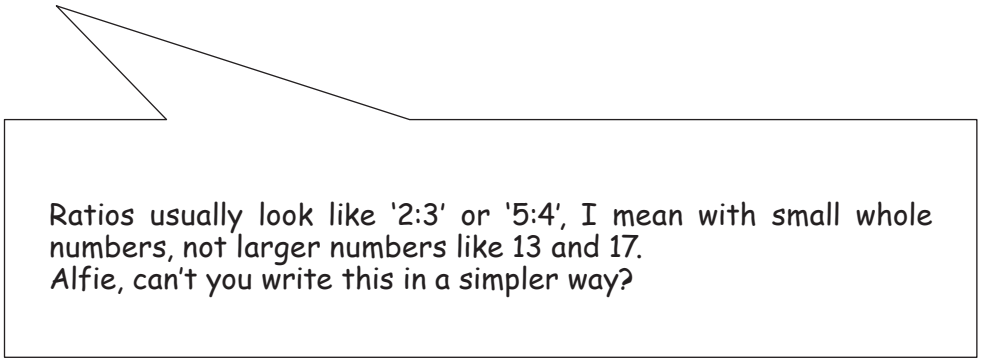
There are 3 different raffle prizes: a bike, roller skates and a teddy bear.

The bike and the roller skates were prizes donated by a local sports shop.
Alfie paid

- £12 for the teddy bear prize,
- £14 to have the raffle tickets printed, and
- £32 to print advertising posters.

After paying the costs, Alfie donates any money raised from the raffle to charity.
He intends to give the money to a children's charity and to the local hospice in the ratio 13:17.

(a) Gary says to Alfie:



How can Alfie explain to Gary that he cannot write the ratio 13:17 in a simpler way? [1]

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(b) Calculate how much money Alfie donates to the local hospice.
Give your answer correct to the nearest £. [4]

5

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10. *GoPrint* and *MyPrint* are two companies specialising in printing business cards.



The charges for the cards are shown in the table below.

<table>
<tr><th>*GoPrint* charges</th><th>*MyPrint* charges</th></tr>
<tr><td>The first 500 business cards are free.

Example prices:
<table><tr><td>1500 cards</td><td>500 free cards +
£10 for the other 1000 cards
Total cost £10</td></tr><tr><td>2500 cards</td><td>500 free cards +
£20 for the other 2000 cards
Total cost £20</td></tr><tr><td>4000 cards</td><td>500 free cards +
£35 for the other 3500 cards
Total cost £35</td></tr></table>
Ask for a price for any other number of cards required!</td><td>The first 1000 cards cost £20.

Buy more than 1000 cards for a small additional cost.

For example:
<table><tr><td>2000 cards</td><td>£20 for the first 1000 cards
+
£5 for the other 1000 cards
Total cost £25</td></tr><tr><td>3200 cards</td><td>£20 for the first 1000 cards
+
£11 for the other 2200 cards
Total cost £31</td></tr><tr><td>4400 cards</td><td>£20 for the first 1000 cards
+
£17 for the other 3400 cards
Total cost £37</td></tr></table>
Ask for a price!
No orders for fewer than 1000 cards are taken.</td></tr>
</table>

(a) After paying £20 for the first 1000 cards, how much **extra** does *MyPrint* seem to charge for each additional 100 cards? [2]

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(b) How much do you think *GoPrint* would charge for 1800 cards? [2]

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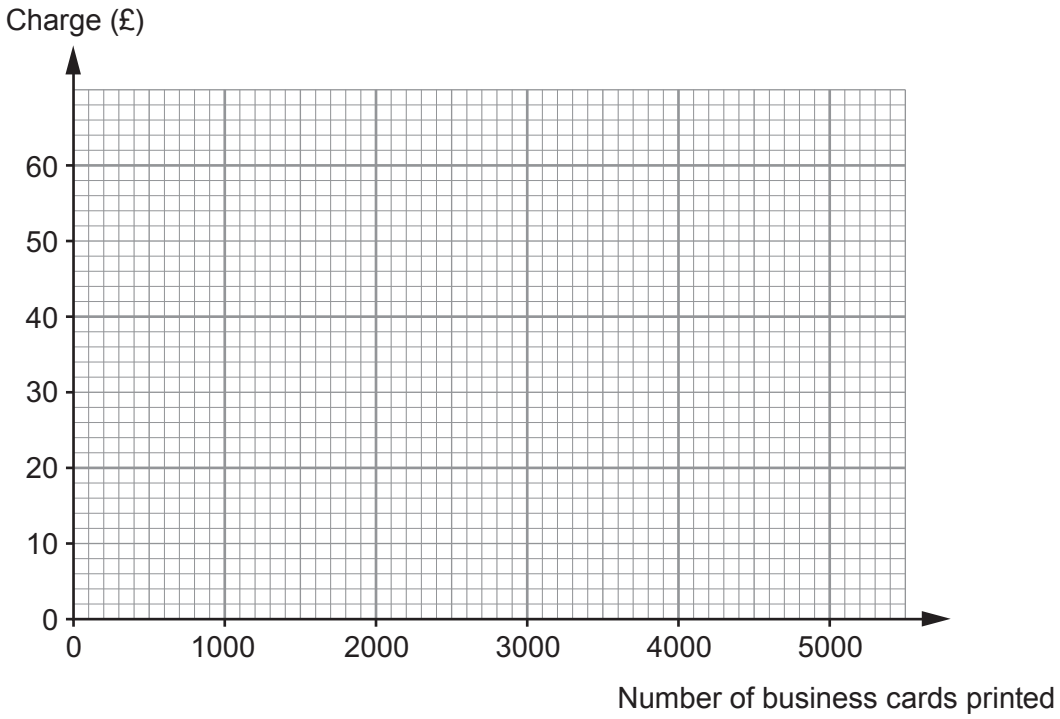
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(c) Use the information given in the tables to draw graphs to represent the *GoPrint* and *MyPrint* charges for printing up to 5000 business cards.
Label your graphs clearly. [5]



(d) Rhian decides to order a number of business cards.
She finds that both of the companies, *GoPrint* and *MyPrint*, would charge the same for her order.
How many cards is Rhian intending to order? [2]

11

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(e) *MyPrint* uses the following formula for working out the charges for business cards,

$$C = 20 + \frac{5(n - 1000)}{1000}$$

where

- C is the charge in £, and
- n is the number of business cards printed.

(i) Use this formula to calculate the charge for 56 500 business cards. [2]

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(ii) A trainee in the offices of *MyPrint* takes a telephone call from a customer requesting 800 business cards.
Explain why the formula cannot be used. [1]

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3

END OF PAPER

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GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINKED PAIR APPLICATIONS
UNIT 1 FOUNDATION
4361-01

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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 1 (FOUNDATION TIER) SUMMER 2016

Applications of Mathematics Unit 1 Foundation Tier	Mark	Comments
1. 23 64 15	B4 4	Otherwise award B1 for each of 23 and 64. Award B1 for any factor of 30 that is a multiple of 3, (03, 06, 15, or 30) expressed as a two digit number. Award final B1 if all 6 digits are different and B2 previously awarded.
2.(a) 15 × (£)1.99 (£)29.85 (b) (i) 15 × 12 180 (ii) bags bought 180 ÷ 2.5 72 bags Cost (£)144 Saves (£)144 – (£)29.85 (£)114.15	M1 A1 M1 A1 M1 A1 B1 M1 A1 9	 FT "their 180" FT "their number of bags" × 2 FT "their derived (£)144" - "their (£)29.85" from (a) *Alternative method for (b)(ii)* *M1 for 1st step of using proportion method that would lead to £144 eg 2.5kg costs £2, 5kg costs £4* *M1 for a complete method using proportion that would lead to £144* *A1 for answer of £144* *M1 Saves (£)144 – (£)29.85 FT "their derived (£)144" - "their (£)29.85" from (a)* *A1 (£)114.15*
2 (c) 250 ÷ 10 25(m) 25 + 25 + 10 + 10 70 m or metres	M1 A1 M1 A1 U1 5	May be seen on diagram. Allow M1 A1 for embedded 25. FT "their 25" provided M1 awarded
3. (a) (i) 4.7 (cm) ± 2mm (ii) 47 (mm) ± 2mm (b) 77 (°) (c) 7.6(cm), 11 (cm), 14.9 (cm) (7.6 + 11 + 14.9) × 2 67 (m) (d) Square of sides 2.3 cm drawn in correct position at A. (e) Trapezium Correct reason given Eg "One pair of parallel sides" or "Only the 2 sides of the garden are parallel". 11	B1 B1 B1 B2 M1 A1 B2 B1 E1	 FT 10 × "their (a)(i)" ± 2° ± 2mm. Check diagram for answers. If 4 measurements given; mark relevant ones (ignore 14.5 cm ± 2mm). Award B1 for either 1 or 2 measurements correct. Accept measurements in mm. FT 'their 7.6, 11 and 14.9' provided at least one correct For unsupported answers in the range 65.8(m) to 68.2(m) award all 4 marks. *Alternatively* *15.2(m), 22 (m), 29.8 (m) B2 ± 0.4m* *Award B1 for either 1 or 2 measurements correct.* *If 4 measurements given; mark relevant ones (ignore 29 m ± 0.4m).* *15.2 + 22 + 29.8 M1 FT* *67 (m) A1* ± 2mm. Award B1 for 2.3(cm) seen OR 1 side of 2.3(cm) drawn OR for square of sides 4.6 cm drawn at A.

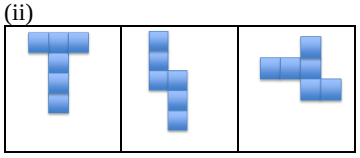
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Applications of Mathematics Unit 1 Foundation Tier	Mark	Comments
4. (a) 2 × (£)23 + (£)16 (£)62	M1 A1	
(b) Method of calculating one correct total price Correct price	M1 A1	
Method of calculating a second correct total price Correct price	M1 A1	If only option given as (£)309 award M1 A1 M1A1 Penalise -1 only for error seen if 3 or more methods considered.
Cheapest option is using a group of 4 and a group of 5 (and 7 standard single) AND costing (£)309.	B1	CAO. This must be stated or clearly implied. Unsupported (£)309 award M1 A1 M1 A1 B0 Without incorrect working B1 implies M1 A1 M1 A1 B1. *Possible options are:* *11 standard and 5 reduced single tickets:* *(£)23 × 11 + (£)16 × 5 = (£)333* *Group tickets, using Group of 4 & Group of 5:* *(£)68 + (£)80 + (£)23 × 7 = (£)309* *Group tickets, using Group of 6:* *(£)92 + (£)23 × 9 + (£)16 × 1 = (£)315* *Group tickets, using 2 Groups of 4:* *(£)68 × 2 + (£)23 × 7 + (£)16 × 1 = (£)313* *Group tickets, using 1 group of 4:* *(£)68 + (£)23 × 9 + (£)16 × 3 = (£)323* *Group tickets, using 1 group of 5:* *(£)80 + (£)23 × 9 + (£)16 × 2 = (£)319*
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 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.
5. (a) White counter placed at (8,2) (b) Coordinates (7, 0) or (3, 4) (c) At least 3 black counters placed at (0,4) (1,5) (2,6) (3,7) (4,8) (5,9) and (6,10) and no incorrect plots.	B1 B1 B3 5	Award B2 for 2 correct and no incorrect **or** 3 or more correct and no more than 1 incorrect. Award B1 for 1 correct and no incorrect **or** 2 correct and 1 incorrect. Award SC1 for sight of at least 2 correct coordinates but not plotted OR award SC1 for at least 3 reversed coordinates plotted with no errors.

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Applications of Mathematics Unit 1 Foundation Tier	Mark	Comments
6. (a)(i) 27 45 63 24 40 56 18 30 42	B2	Award B1 for any correct row or column
(ii) P(win) 10/25 oe	B2	FT "their table of values in (a)(i)". Award B1 for either a numerator of 10 or a denominator of 25 in a fraction <1
10/25 × 200	M1	FT "their 10/25"
80 winners	A1	
200 × (£)1 – 80 × (£)1.50	M1	*120 × (£)1 - 80 × (£)0.50 or equivalent.* FT "their derived 80"
(£)80 for charity	A1	
(b) (i) 1/6	B1	
(ii) 	B2	Award B1 for 1 or 2 correctly identified and none incorrect OR 3 correctly identified and one incorrect.
	11	
7. 035° ±2° from Glenod 125° ±2° from Trefwen	B1 B1	Use 'their N' provided only ±2° from the given N
Correct position of the visitor centre	B1	Accept intersection shown FT provided at least B1 previously awarded
250(°) ±2° from Hafon	B1	Use 'their N' provided only ±2° from the given N Strict FT from their position of the visitor centre
	4	
8. In any order, any 3 factors: • Not from exactly same height, not from the same window • Timing may be inaccurate / different stopwatches • Ground may not be level, may not land in the same place • Someone may throw the coin up first, someone could throw with force • Gust of wind might take one of the coins • (Allow) not the same coin used	B3 3	B1 for each correct factor Accept any other valid factor Allow - height of window from the ground - 'weight' of coin different 'Coins are different sizes' and 'coins have different masses' is counted as 1 factor
9.(a) Explanation that mentions no common factor (other than 1), or 13 & 17 as prime numbers, or that it is not possible to divide (to simplify) 13 & 17 by any number except 1 (to result in whole number values)	E1	Allow 'neither of these numbers are divisible by the same number', or '13 & 17 can't be divided by a smaller whole number' Do not accept 'both numbers are odd and can not be simplified further', '13 & 17 don't go into the same number', '13 does not go into 17'
(b) (Money from sales of raffle ticket – costs) 480×50p – £12 – £14 – £32 or equivalent (£182)	M1	Intention to calculate 'total raised – costs' (= 240 – 58)
÷30 ×17	M1	FT 'their derived 182'
(£)103	A2	CAO. A1 for 102 or 103.(...) Allow A1 only as a FT, provided 'their error' is not with place value, depends on previous M1 *Treat ÷30×13 as a misread (leading to 78.866… or 79)*
	5	

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Applications of Mathematics Unit 1 Foundation Tier	Mark	Comments
10. (a) Use of £5 per 1000 cards	M1	For example 1000 ÷ 5 (= 200 cards for £1), or sight of 200 (cards) with £1, or 5 ÷ 1000 (= £0.005 per card)
£0.5(0) or 50p (per 100 cards)	A1	If units are given they must be correct, allow £0.50p *SC1 for misread as GoPrint with answer £1*
(b) Use of £10 per 1000 cards for 1300 cards	M1	Or sight of 1800÷100 – 5, or equivalent
£13 (for 1800 cards)	A1	*If no marks, award SC1 for an answer of £18*
(c) GoPrint: Any 2 points correctly plotted	M1	
(Dotted) straight line correctly drawn from (500, 0) to beyond 4000 cards	A1	
MyPrint: Any 2 points correctly plotted	M1	
(Dotted) straight line correctly drawn starting from (1000, 20) to beyond 4400 cards	A2	A1 for correct (dotted) straight line but drawn for values less than (1000, 20) to beyond 4400 cards, OR for line correctly drawn starting from (1000, 20) to 4400 cards (not beyond)
(d) Intention to interpret the intersection of the two graphs OR correct interpretation from the table	M1	FT their graphs provided at least one of the lines is straight
Correct reading for the number of cards or 4000 cards	A1	Answer of the cost implies M1 only, however accept an answer including the cost e.g. '4000 cards is £35'
	11	
10. (e)(i) 20 + 5(56500 – 1000)/1000	M1	
(£)297.5(0)	A1	
(ii) Reason, e.g. 'formula only for number of cards greater than 1000', 'n – 1000 is negative', 'don't know charges for less than 1000 cards', 'don't take orders for less than 1000 cards', 'because 800 – 1000 is negative', or 'as 800 – 1000 = -200'	E1	Ignore any additional incorrect statement included Do not accept 'they can use it, the cost would be £19'
	3	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

W16-4361-01

APPLICATIONS OF MATHEMATICS
UNIT 1: Applications 1
FOUNDATION TIER

A.M. WEDNESDAY, 13 January 2016

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**3**	
3.*(a)*	**3**	
3.*(b)*	**3**	
3.*(c)*	**2**	
3.*(d)*	**2**	
3.*(e)*	**4**	
4.	**3**	
5.	**2**	
6.	**7**	
7.	**8**	
8.*(a)*	**7**	
8.*(b)(c)*	**6**	
9.	**3**	
10.	**7**	
11.	**7**	
12.	**9**	
Total	**80**	

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**.

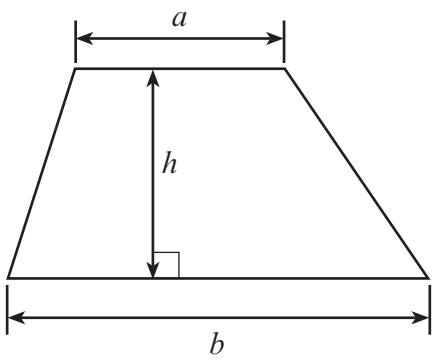
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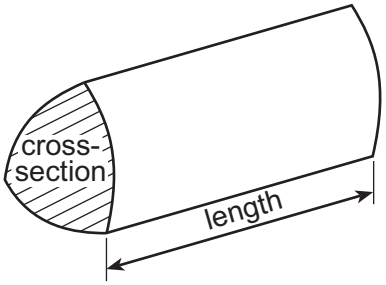
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Formula List

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



Volume of prism = area of cross-section × length



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1. *(a)* Siân has a bag containing 20 sweets.

10 of them have a strawberry flavour and 10 have an orange flavour.

Siân chooses one sweet at random.

Circle the best expression from those given below to describe the chance of Siân choosing a strawberry flavour sweet. [1]

impossible **unlikely** **even chance** **likely** **certain**

(b) Four friends, Ellie, Kieran, Tom and Nia enter a competition.

One friend is selected at random to win the competition.

Circle the best expression from those given below to describe the chance of Tom winning the competition. [1]

impossible **unlikely** **even chance** **likely** **certain**

(c) Paula writes each of the 10 letters of the word CAERNARFON on cards and places the cards face down on the table.
She selects one card at random.

(i) Paula thinks the probability of obtaining any of the letters is the same.
Explain why Paula is incorrect. [1]

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(ii) What is the probability of Paula **not** obtaining the letter E from the word CAERNARFON? [1]

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4

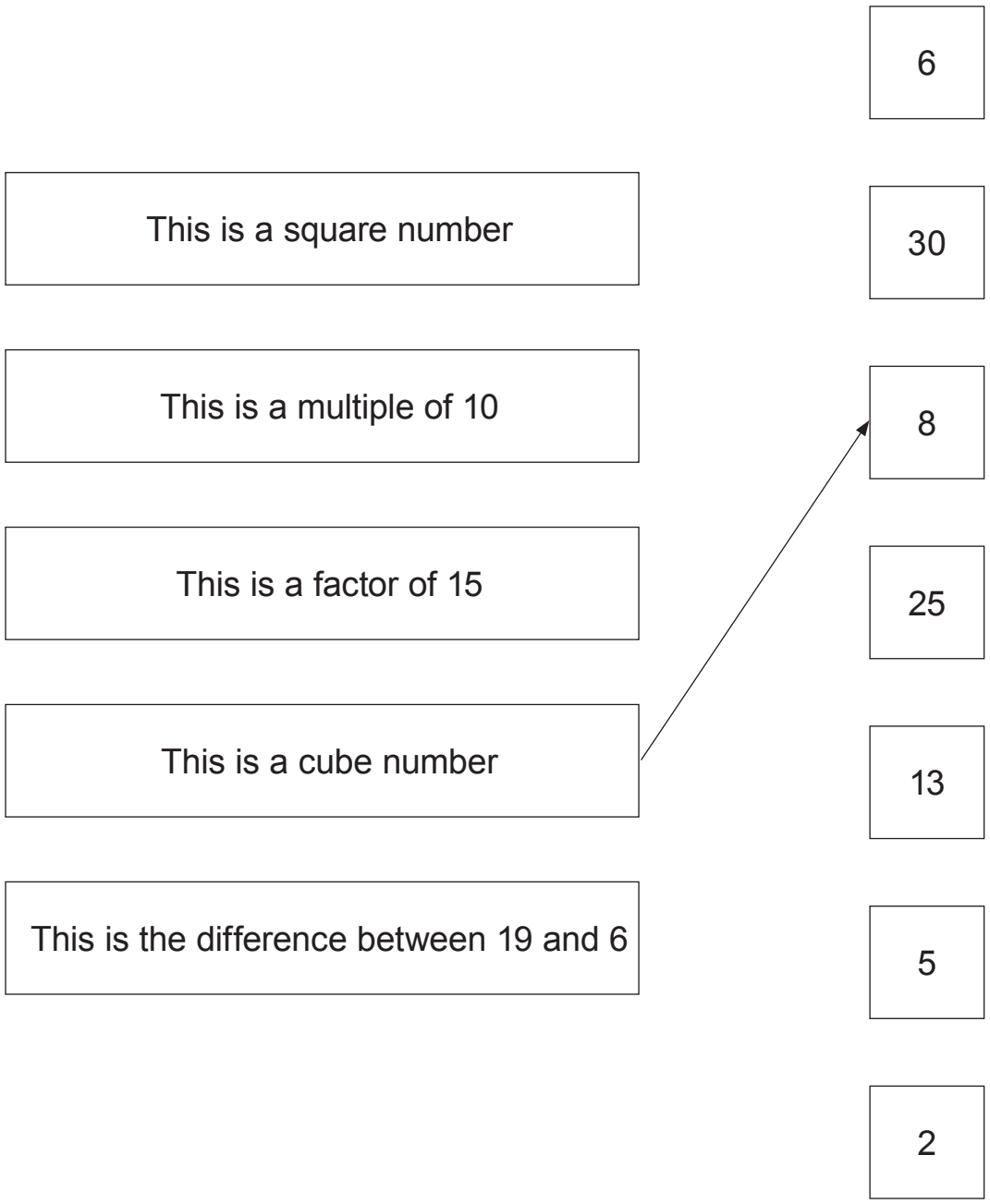
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2. Emyr has to match each statement with a number.
He has already matched one correctly.
Match each of the other statements with a correct number. [3]



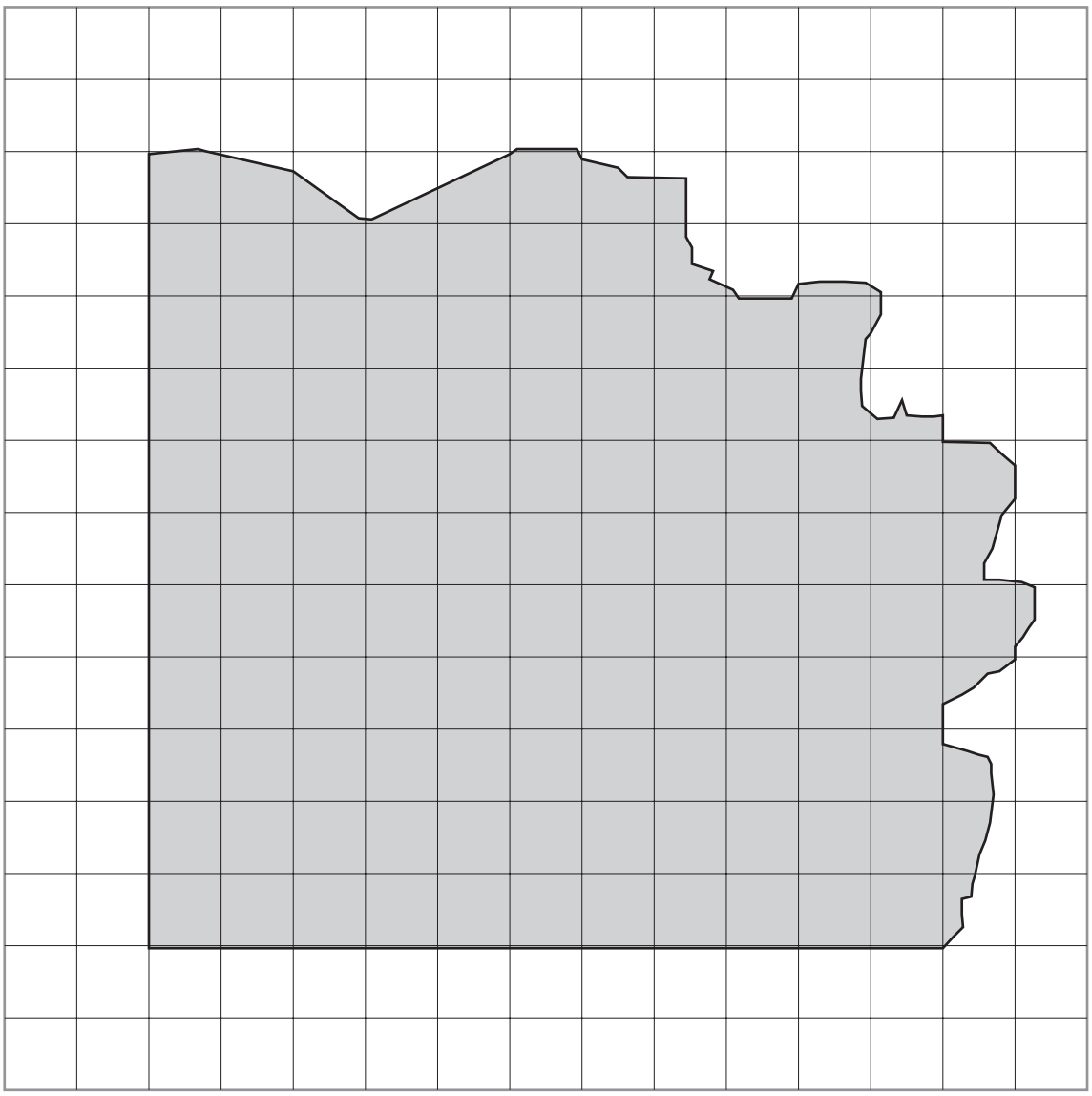
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3. *(a)* A clothes designer has a small piece of material, which is shown below on the centimetre square grid.



Estimate the area of the small piece of material.
State the units of your answer.

.....

.....

.....

Estimate for the area of the small piece of material = ...

[3]

3

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(b) The designer wants to have a new emblem for the clothes that he creates.

The new emblem has:

- a rectangle measuring 11 cm by 9 cm,
- a circle of radius 3·5 cm,
- the centre of the circle at the centre of the rectangle.

In the space below, draw the emblem accurately. [3]

3

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(c) The designer decides to alter the outline of his emblem.
He cuts out a square of side 2 cm from the top right-hand corner of the rectangle and places it at the bottom left-hand corner, as shown in the sketch below.

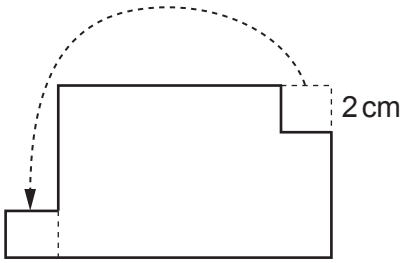


Diagram not drawn to scale

What is the difference between the perimeter of the original rectangle and the perimeter of the outline of the new emblem?
You must explain your answer. [2]

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2

(d) The designer uses the following formula to work out how much it will cost to make an item of clothing.

Cost of making an item = (1·1 × time × cost per hour) + (2·2 × cost of materials)

Time is in hours and all costs are in £.

The time taken for making an item is 7 hours.
The cost per hour is £6.
The cost of the materials is £50.

Calculate how much it will cost to make this item. [2]

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(e) The designer packs his items in boxes shaped as cuboids as shown below.

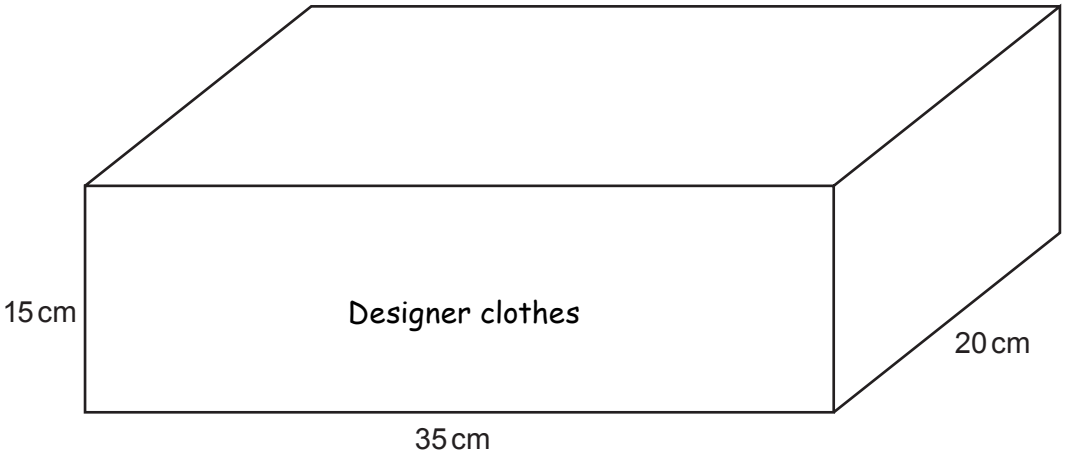


Diagram not drawn to scale

The base of the box is 35 cm long and 20 cm wide.
The box is 15 cm high.

Draw an accurate scale drawing of a net of the box on the opposite page.
Use a scale of **1 cm to represent 5 cm**.

An accurate scale drawing of the base of the box has already been drawn for you on the opposite page. [4]

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4

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4. Clive works for a car company.

He is asked to conduct a survey of the most popular colour of car that people buy.

(a) Where do you think Clive should conduct his survey?
Give a reason for your answer. [1]

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(b) Would Clive get the same results if he repeated his survey on a different day?
Give a reason for your answer. [1]

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(c) Part of the way through his survey, Clive has recorded 18 black cars and 12 white cars.
Write this ratio of black cars to white cars in its simplest form. [1]

.....

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3

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5. In a class, pupils were having a discussion about rounding values.

(a) Kim said: "175·1 rounded to the nearest 10 is 170."

Is Kim correct? Explain your answer. [1]

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(b) Ali had been to see a concert the night before.
There were 7431 people at the concert.
He said: "There were around 7000 people at the concert last night".

Explain why this was a reasonable comment. [1]

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2

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

Karen and her friend want to paint their garden fences.
They see the following offers for paint at *Paint4U*.

£13.99	£29.99	£49.99
		

Karen and her friend both buy 20 litres of the same paint from *Paint4U*.
Karen spends £79.84 less than her friend.
Explain how this could have happened.
Show all your working. [7]

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7. Hannah bought a rectangular mirror.
The mirror is made up of triangles and quadrilaterals.

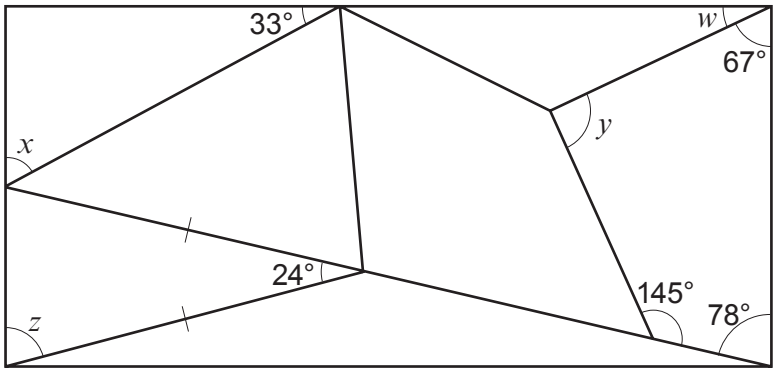


Diagram not drawn to scale

Write down the size of the angles w, x, y and z. [8]

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w = ... ° x = ... ° y = ... ° z = ... °

8

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8.



The table shows the midday temperature readings that were recorded in Paris on the first day of each month.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature (°C)	7	10	13	15	20	23	25	24	20	16	11	8

(a) Find the mean, median, mode and range of these temperature readings and complete the tables below. [7]

.....

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Mean midday temperature (°C)	

.....

.....

Median midday temperature (°C)	

.....

Modal midday temperature (°C)	

.....

.....

Range of the midday temperature (°C)	

7

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(b) Jenny looks at the midday temperatures for Paris and says:

"If I go on holiday to Paris in May, the hottest it will be is 20°C."

Is Jenny's statement correct? Give a reason for your answer. [1]

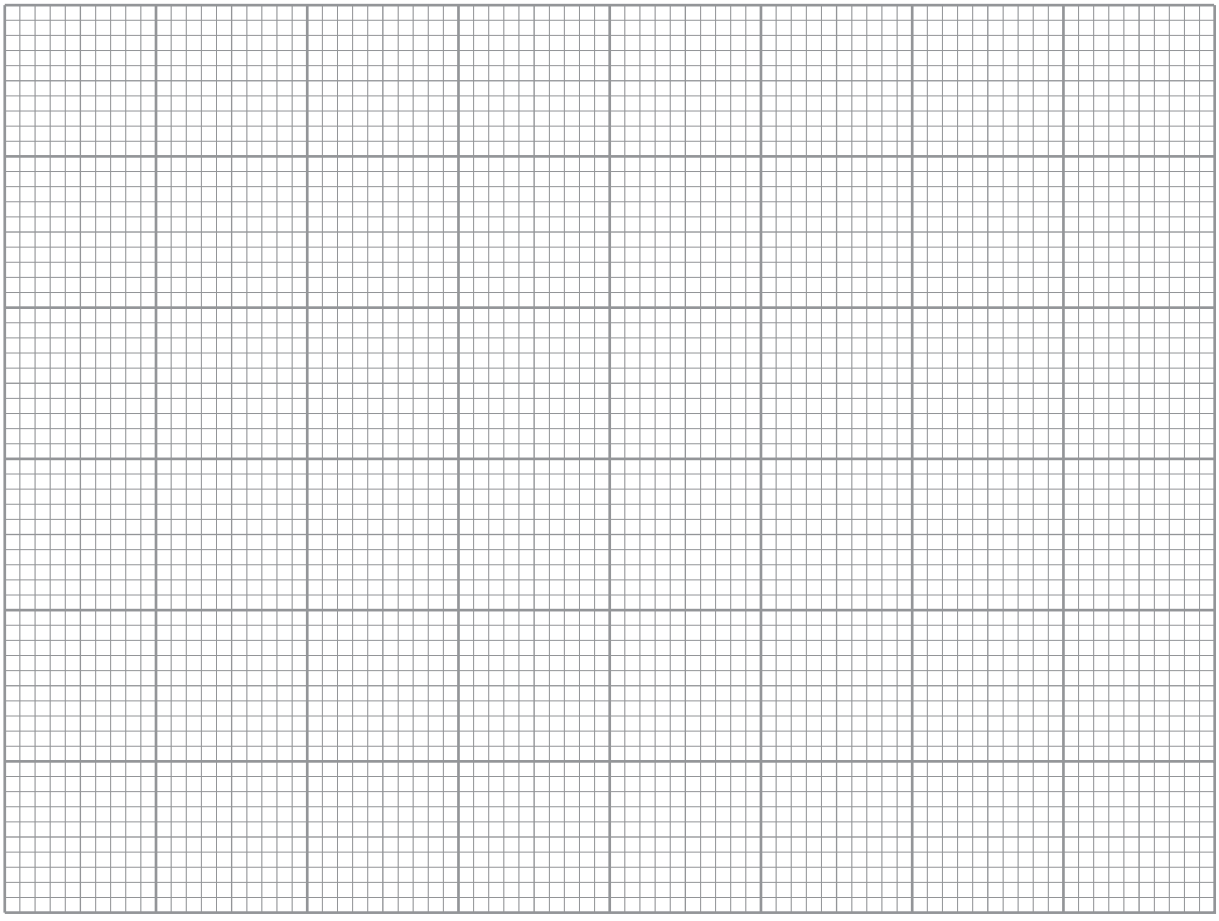
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(c) Jenny prefers to see data displayed graphically.

(i) Draw a time series graph, using the data on the previous page, to show the midday temperature readings that were recorded in Paris on the first day of each month. [4]



(ii) Describe fully what happens to the midday temperature readings that were recorded in Paris on the first day of each month over the course of the year. [1]

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6

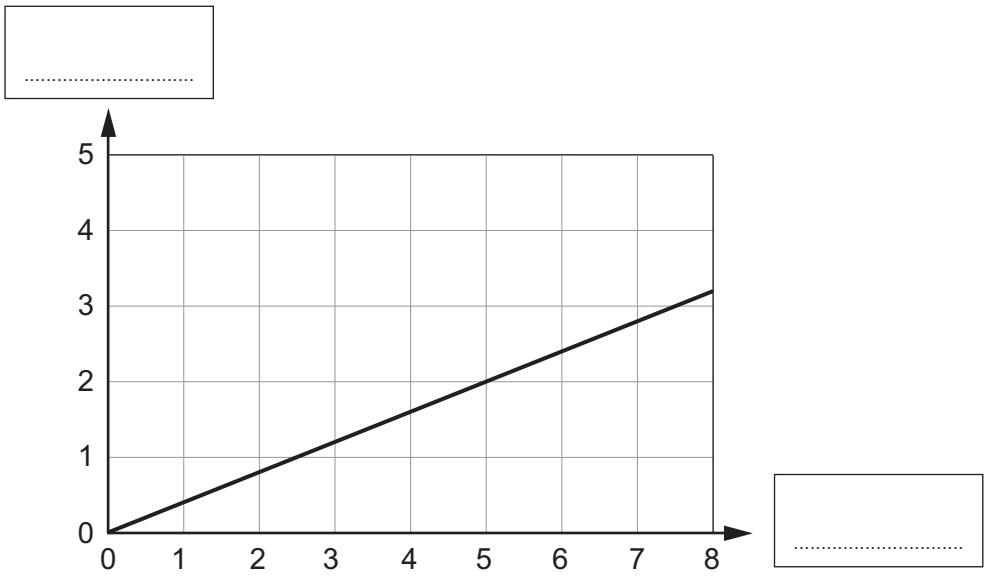
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9. *(a)* The graph below converts centimetres to inches.
2 inches are equivalent to approximately 5 centimetres.

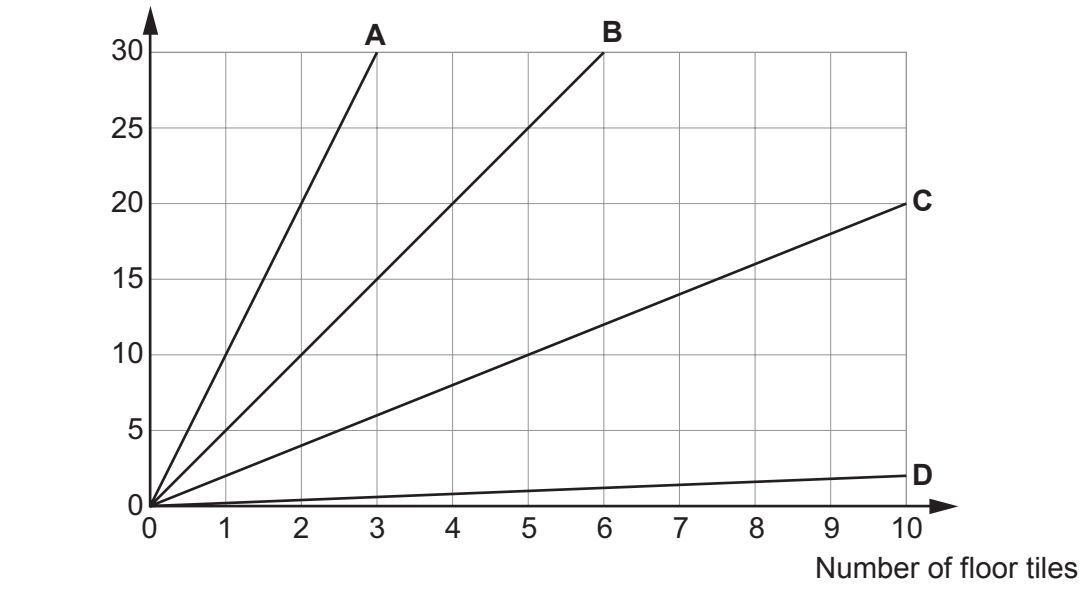
(i) Label the axes correctly. [1]



(ii) Use the graph to complete the following statement. [1]

..... centimetres = 3 inches

(b) The graph below shows the time taken in minutes to lay floor tiles by 4 different tilers.



One of the tilers takes 10 minutes to lay 2 floor tiles.
Which line on the graph shows this: A, B, C or D? [1]

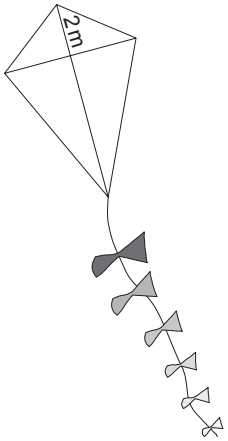
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10. Rowena decides to make a scale drawing of a kite without its tail.



The lengths of the diagonals of this kite are 3 m and 5 m.
The two diagonals meet at a point.
The length of the longer diagonal above this point is 2 m.

(a) Rowena decides to use a scale of 2 cm to represent 1 m.

Draw the scale drawing of the kite for Rowena. [5]

Scale:
2 cm to represent 1 m

(b) To cut the fabric to make the kite, Rowena needs to measure the size of the angle at each of the vertices.
Write down the size of these angles. [2]

..... ° ..... ° ..... ° and ..... °

7

Turn over.

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11. *(a)* An air parcel company, *FlyPack*, wants to build a helicopter base.

The helicopter base is to be
- equidistant from Shrewsbury and Hereford, **and**
- equidistant from Aberystwyth and Newtown.

The map below is drawn to scale, but the scale has been left out.
Using a pair of compasses and a ruler, indicate the position of the helicopter base on the map.
You must show any lines that you use. [3]



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(b) The distance from Haverfordwest to Carmarthen is approximately 33 miles.

Complete each of the following sentences. [4]

Rhyl is approximately ..... miles from Shrewsbury.

The bearing of Rhyl from Shrewsbury is .....°.

Carmarthen is approximately ..... miles from Newtown.

The bearing of Carmarthen from Newtown is .....°.

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12. Charlotte runs a snack bar.
She makes and packs 3 varieties of sandwiches to sell.

All her sandwiches sell for £1.50 per pack.

She keeps a list of sandwiches sold during the first hour one Monday morning.

Time sold	Number of sandwiches sold			Total number of sandwiches sold
	Salmon	Cheese	Chicken	
09:00 up to 09:15	4	2	4	10
09:15 up to 09:30	2	8	0	10
09:30 up to 09:45	3	3	4	10
09:45 up to 10:00	5	3	2	10

(a) What is the best estimate of the probability that the next sandwich Charlotte sells will be a cheese sandwich? [2]

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(b) Charlotte is thinking she might reduce the price of the least favourite sandwich in order to sell more of them to her customers.
Which sandwich would this be?
Do you think by doing this Charlotte will take more money?
You must explain your answer. [1]

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Charlotte decides not to introduce a special offer.



All sandwiches £1.50 per pack

(c) Express the ratio of the total number of salmon to cheese to chicken sandwiches sold during the first hour on Monday morning in its simplest form. [2]

(d) Early on Tuesday morning Charlotte prepares the sandwiches for the day.
She uses the same ratio as the sales for the first hour of Monday morning.

She makes a total of 220 sandwiches.
How many of these sandwiches should be salmon? [2]

(e) The following day Charlotte finds she sells the same number of salmon sandwiches as she does chicken sandwiches.
She also notices that she sells twice as many cheese sandwiches as either salmon or chicken sandwiches.

- Why might making sandwiches ready for sale in the same ratio as those sold during the first hour on Monday morning be a problem?
- How could Charlotte improve her strategy for making sandwiches in advance?

You must clearly explain your answers. [2]

END OF PAPER

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GCSE MARKING SCHEME

JANUARY 2016

APPLICATIONS OF MATHEMATICS
UNIT 1 - FOUNDATION TIER
4361/01

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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.

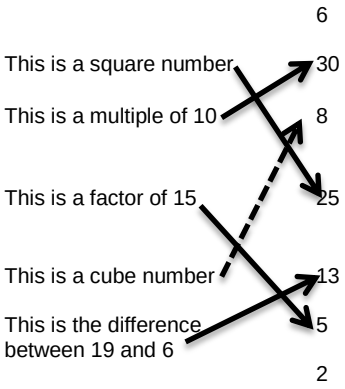
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

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

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GCSE APPLICATIONS OF MATHEMATICS
UNIT 1 - FOUNDATION TIER

MARK SCHEME – JANUARY 2016

Applications Unit 1 Foundation Tier January 2016		Comments
1. (a) Even chance (b) Unlikely (c) (i) Correct explanation of why Paula is incorrect (ii) 9/10 or equivalent	B1 B1 E1 B1 4	 Eg " there are more letter As, Rs and Ns than the other letters", "because some of the letters are repeated", "Because there are 2 As" etc
2.  	 B3 3	 Award B2 for any 2 or 3 correct. Award B1 for one correct.
3. (a) Evidence of counting squares Answer in range 112 - 116 cm^2	M1 A1 U1 3	 Independent mark
3. (b) Rectangle 11cm by 9cm drawn accurately Circle radius 3.5cm drawn accurately Circle in correct position	B1 B1 B1 3	± 2mm ± 2mm ± 2mm
3. (c) 4cm and valid explanation given	B2 2	Eg Award B2 for "4cm because the total perimeter of original is 40cm and the perimeter of the new shape is 44cm." OR "The perimeter of the top right hand corner has not changed but the bottom left has increased by 4cm." Award B1 for sight of 40 or 44 OR B1 for 4cm with no explanation OR B1 for statement such as "the top right hand corner has not changed"
3. (d) 1.1 × 7 × 6 + 2.2 × 50 = (£)156.2(0)	M1 A1 2	
3. (e) For indication to use 3 cm as a side within a net Use overlay Correct net with all 5 additional rectangles correct. 2 rectangles 7 cm × 3 cm 1 rectangle 7 cm × 4 cm 2 rectangles 3 cm × 4 cm	B1 B3 4	May be seen on given diagram or may be implied from their scale drawing. Use overlay (± 2mm) Award B2 for 3 or 4 correct rectangles forming part of a correct net OR for all 5 rectangles correct but with an incorrect net. Award B1 for 1 or 2 correct rectangles forming part of a correct net OR for 3 or 4 rectangles correct but with an incorrect net.

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Applications Unit 1 Foundation Tier January 2016		Comments
4. (a) Suitable place given with a reason implying access to a number of cars or a number of people.	E1	Eg "at the side of a busy road because there are many different colour cars" OR "in a supermarket because there are lots of people" OR "car company/garage/petrol station as will see cars people own/buy"
(b) No (or not exactly) and reason given	E1	Reason based on when a survey is repeated there will usually be different outcomes eg "different cars could be on the road on another day" OR "different people have different choices" OR "different people asked" OR "no, it might be less busy" OR "different people have different tastes/opinions"
(c) 3 : 2	B1 3	CAO
5. (a) Kim not correct implied or stated with a valid explanation.	E1	Eg "No, as she has rounded down to 170 when for 175.1 she should have rounded up to 180", "no, it should be 180", "no because it's a 5 so needs to be a higher value", "no because it's past half-way so will go higher".
(b) Valid explanation given	E1 2	Eg "because 7431 rounded to the nearest 1000 is 7000", "because this is a good estimate", "it's about 7000", "it's been approximated", "it's been rounded to the nearest 1000".
6. For any 2 correct methods for costing 20 litres For the sight of (£)279.8(0) and (£)199.96 from appropriate working Convincing explanation stated or implied. 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	M2 A2 E1 Q W C 2 7	Award M1for any 1 correct method for costing 20 litres. Award A1 for any 1 correct costing for 20 litres. Eg Karen bought the 5 litre tins AND her friend bought the 1 litre tins *Eg.* *(Cost of 1 litre tins) (20 × (£)13.99 =) (£)279.8(0)* *(Cost of 2.5 litre tins) 8 × (£)29.99 = (£)239.92* *(Cost of 5 litre tins) 4 × (£)49.99 = (£)199.96* 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 1 Foundation Tier January 2016		Comments
7. $w = 90 - 67$ $w = 23(^\circ)$ $x = 180 - (90 + 33)$ $x = 57(^\circ)$ $y = 360 - (67 + 145 + 78)$ $y = 70(^\circ)$ $z = (180 - 24) \div 2$ $z = 78(^\circ)$	M1 A1 M1 A1 M1 A1 M1 A1 8	
8. (a) sum of the numbers (= 192) sum ÷ 12 Mean = 16 Put in order 7, 8, 10, 11, 13, 15, 16, 20, 20, 23, 24, 25 Median = 15.5 Mode = 20 Range = 18	M1 M1 A1 M1 A1 B1 B1 7	Attempt to add all given values Divide answer in the range 167-217 CAO Sight of 15 and 16 would gain M1.
8. (b) No, implied or stated, with a reason given (c) (i) Correctly labelled axes Uniform scales used Points plotted correctly Points joined with straight lines (ii) Description of trend given for the whole year. 6	E1 B1 B1 P1 L1 E1	Eg “no, as 20˚C is the temperature on the first day of the month, it could then be hotter”. Allow “no, because it could hotter after midday”, “no, as 1stday of month not all month”, “no, that is just at midday”, “doesn’t mean it will not get hotter or colder”. FT their plotted points. Accept solid or dotted lines Eg “the temperature increases through the year until July and then decreases”, “it peaks and then cools down”
9. (a) (i) Centimetres labelled on x-axis AND Inches labelled on y-axis (ii) Answer in range 7.4 – 7.6 cms (b) B	B1 B1 B1 3	 FT from incorrect labels, answer in range 1.1 – 1.3 (cm)

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Applications Unit 1 Foundation Tier January 2016		Comments
10(a) Correct scale used with diagonals 6cm and 10cm Longer diagonal split 4 cm and 6 cm at intersection Shorter diagonal split 3 cm and 3 cm Diagonal intersection 90° (±2°) Outline of the kite correct (b) Both obtuse angles AND Head and tail angles correctly measured, ±2°	B1 B1 B1 B1 B1 B2 7	 FT their consistent scale if possible FT their kite for an equal split of the shorter diagonal, a kite must be seen May not be shown, implied provided kite outline seen CAO, not FT *Diagonals given treated as sides, award:* *B1 if scale of sides is correct,* *B0* *B1 if their kite has an equal split of the shorter diagonal,* *B0,* *B0* FT their quadrilateral B1 for any 2 or 3 angles correctly measured, ±2° (Approximately 74°, 53°, 117°, 117°, but measure their angles) There is no requirement for their angle sum to be 360°
11.(a) Perpendicular bisector (±2°) between Shrewsbury and Hereford Aberystwyth and Newtown Helicopter base indicated (b) 62 miles (±5 miles) AND 325 ° (±2°) 70 miles (±5 miles) AND 225 ° (±2°)	 B1 B1 B1 B2 B2 7	 *Arcs must be shown* *Arcs must be shown* Accept sight of the intersections of the perpendicular bisectors FT provided B1 previously awarded and the other perpendicular bisector is within ±4° tolerance *If B0, B0 due to no arcs, allow FT for possible final B1 provided perpendicular bisectors used* Accept the intersection of the two perpendicular bisectors as their indication. FT provided at least one line accurate but the other slightly outside the tolerance, ±4° B1 for each answer B1 for each answer *If neither B1 given for bearings then allow SC1 for bearings meeting ±4° tolerance*
12.(a) 16/40 or equivalent ISW (b) Chicken AND conclusion, e.g. 'Reduce Chicken, yes more money because people will buy more', or 'Chicken, she will not take more as same number of sandwiches might be sold, less takings' (c) 7 : 8 : 5 (d) 7 × 220 ÷ (7+8+5) or 220 × 14/40 or equivalent 77 (salmon sandwiches) (e) Implies first hour and /or Monday morning may not be typical Strategy to improve, e.g. 'need to collect more data', 'need to make the list for more than the first hour'	B2 E1 B2 M1 A1 E1 E1 9	B1 for either 16/ … or …/40 B1 for sight of 14:16:10, sight of 7, 8 and 5 in order FT from their ratio for M1 only Must be the flaw in the current strategy Must be a way to improve the strategy

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

S15-4361-01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. THURSDAY, 4 June 2015

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**12**	
2.*(a)*	**8**	
2.*(b)(c)*	**7**	
2.*(d)(e)*	**9**	
3.*(a)*	**7**	
3.*(b)*	**3**	
4.	**9**	
5.	**5**	
6.	**7**	
7.	**8**	
8.	**5**	
Total	**80**	

4361 010001

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.

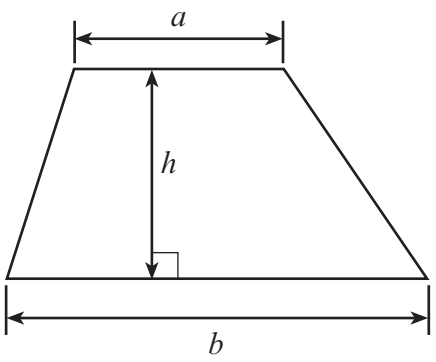
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2***(a)*.

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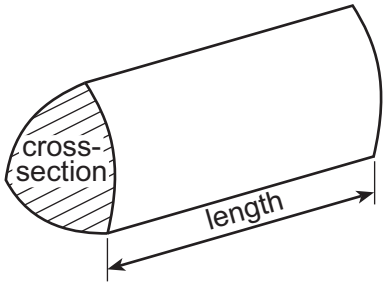
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Formula List

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



Volume of prism = area of cross-section × length



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1. A celebrity has been given a challenge to raise money for charity.
The challenge is for the celebrity to sit on each of the 45 000 seats in a sports stadium.



The celebrity must:
- sit on 9000 seats in one day,
- sit on each seat for 4 seconds.

(a) How many days will it take to complete the challenge? [2]

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(b) How many seats is the celebrity expected to sit on in a minute? [2]

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(c) (i) Calculate the number of hours each day that the celebrity will sit on seats in the stadium. [4]

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(ii) Explain why the time taken for the challenge is likely to be longer.
What have the organisers not taken into consideration? [1]

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(d) The celebrity hopes to raise £180 000 for charity.
The celebrity has already raised $\frac{1}{3}$ of this amount.
How much more money does he hope to raise? [3]

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Turn over.

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2. Mr Jones lives in Orchard Close where the residents decide to hold a street party to celebrate his 90th birthday.



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

Including Mr Jones, there are 22 residents who live in Orchard Close.

The other 21 residents each contribute £10 towards the party.

Mr Jones' birthday cake is given free by the local baker.
Residents bring their own drinks.

12 large packets of crisps are bought for £1.89 each.
The local baker supplies 22 plates of sandwiches at £3.50 each.
44 sausage rolls are bought from the local baker for a total of £23.89.
4 large bowls of salad are bought for £8.99 each.
The total cost of the material for the tables and decorations is £50.

Does the money given by the residents cover the costs for all the items bought for the street party?
You must show all your working. [8]

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(b) A stand with a circular top is made to hold the birthday cake.
The radius of the circle is 30 cm.
Draw an accurate diagram of the circle, **using a scale of 1 cm to represent 5 cm.** [2]

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(c) Decorations are made to decorate the tables for the street party.
They are made in the shape of right-angled triangles, as shown below.

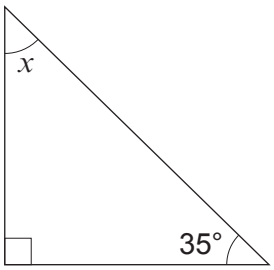


Diagram not drawn to scale

(i) Calculate the size of the angle x. [2]

.....

.....

(ii) Draw accurately the right-angled triangle shown above. [3]

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(d) (i) A rectangular sheet of material is needed to cover each of the 5 rectangular tables for the street party.
The dimensions of each rectangular sheet are 150 cm by 80 cm.
What is the total area of material needed?
Clearly state the units of your answer. [4]

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(ii) The 5 tables for the street party are joined together.
It is possible for two people to sit at each of the longer sides of a rectangular table.
It is possible for one person to sit at each of the shorter sides of a rectangular table.
Draw a diagram to show where the 22 people of Orchard Close will sit. [2]

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(e) At the street party, two raffle tickets are given to each resident.
What is the probability that Mr Jones wins the first prize in the raffle?
Give your answer in its simplest form. [3]

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3. *(a)* You are asked to check Paige's revision homework.
She has answered all 10 questions.
The revision homework questions and Paige's answers are given in the table below.

Question number	Question	Paige's answer
1.	Change 4·5 cm into mm.	45 mm
2.	Find the value of 2^3.	6
3.	Simplify $6y - y$.	6
4.	Is 6 a factor of 12?	Yes
5.	What word would you use to describe the chance that the next day after Sunday is Monday?	Likely
6.	Approximately how many pints are there in a litre?	$1\frac{3}{4}$ pints
7.	What is $\frac{1}{2}$ of $8a$?	$4a$
8.	What is the probability of obtaining a number greater than 5 on one throw of a fair 6-sided dice?	$\frac{1}{3}$
9.	What is the name of a quadrilateral that has only one pair of parallel sides?	Kite
10.	If $x = 3$, what is the value of $x - 7$?	4

Complete the table below to indicate whether Paige's answers are correct or not.
If any of her answers are incorrect, you must give the correct answer.
The first one has been completed. [7]

Question number	Correct? Yes or No	If No, give the correct answer
1.	Yes	
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

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Extra working space

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(b) Paige's revision homework is always marked out of 10.
Her last 3 marks for her homework have a median of 7, a range of 4 and a mode of 7.
Complete the boxes below to show the last 3 marks that Paige had for her revision homework. [3]

Working: .....

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3

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4. One day, Gary cycles from his house to a café 15 miles away.
He leaves his house at 11 a.m. and cycles for an hour to the café.
He stops at the café for half an hour to have a drink.
He then heads home but stops after $\frac{3}{4}$ hour to fix a puncture 4 miles from his house.
It takes him 15 minutes to fix the puncture.
He then cycles the last 4 miles back home at a speed of 8 miles per hour.

(a) On the graph paper below, draw a travel graph to show Gary's journey. [6]



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Extra working space

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(b) Using your graph, state what time Gary arrived home after his cycle ride. [1]

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(c) At what time in the afternoon was Gary 13 miles away from the café? [2]

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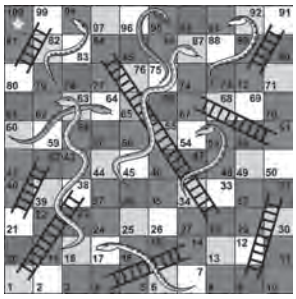
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5. *Vintage Games* makes board games such as snakes and ladders.



Vintage Games decides to make a biased spinner to include with their board games.
The spinner is numbered 1 to 4.
The probability of scoring each of the numbers has been decided.

Number	1	2	3	4
Probability	0·1	0·3	0·4	.....

(a) Complete the table. [1]

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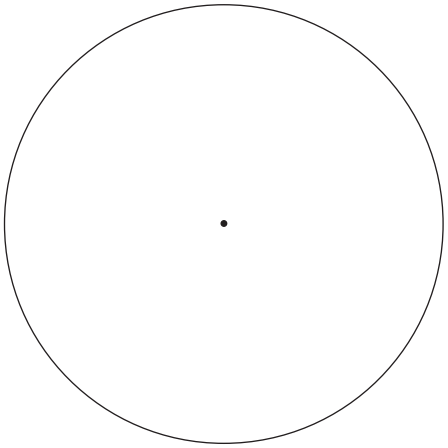
(b) An outline of the biased spinner to be made by *Vintage Games* is shown below.
The centre of the spinner has been marked.
Using the information in the table, complete an accurate drawing of the biased spinner.
You must show your working. [4]

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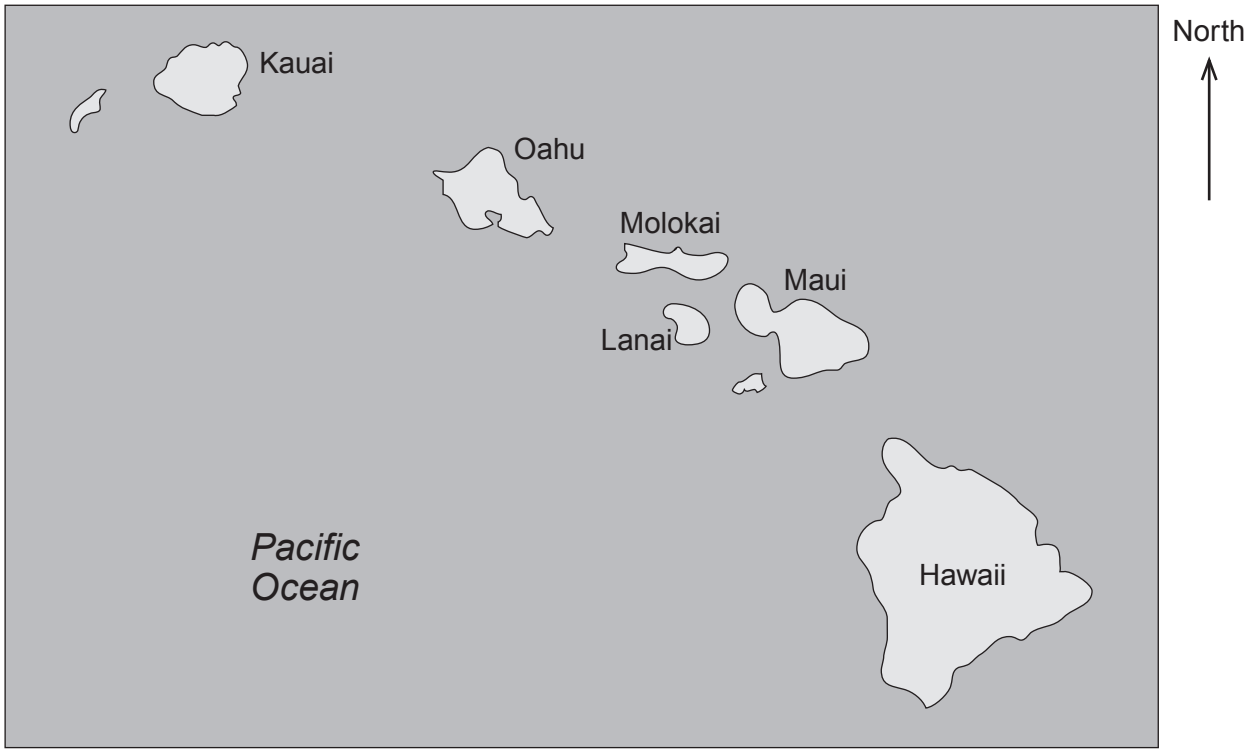
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6. The state of Hawaii in the USA consists of 8 main islands.
The six largest of these islands are Hawaii, Maui, Oahu, Kauai, Molokai and Lanai.



(a) The land area of Oahu is 596·7 square miles.
1 square mile is approximately 2·59 km^2.
Calculate the land area of Oahu in km^2.
Give your answer correct to 3 significant figures. [3]

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(b) Place points on the diagram to mark the approximate centres of the islands of Kauai and Maui.

(i) Use these two central points to complete the sentence below. [3]

The island of Kauai is on a bearing of ..... from the island of Maui.

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(ii) Why is there a risk that your answer for the bearing may not be completely accurate? [1]

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7. *EcoEstates* has considered the dimensions of rectangular sports halls.
The dimensions have been expressed algebraically, as shown on the plan.

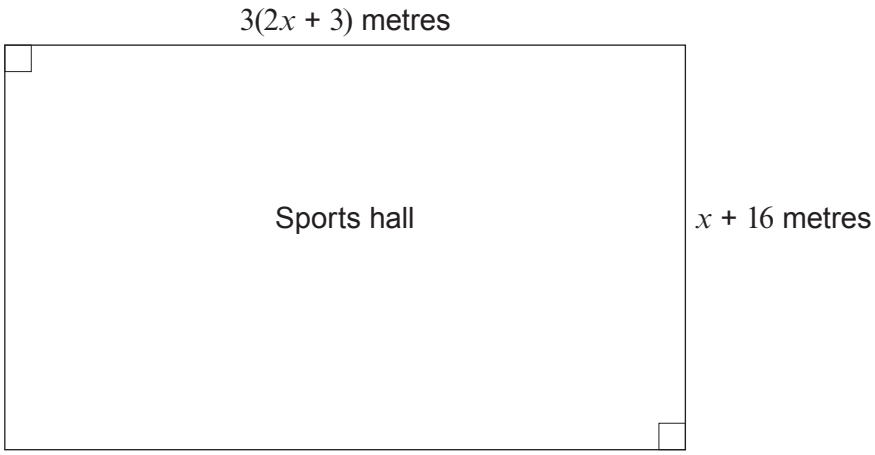


Diagram not drawn to scale

(a) Find the perimeter of a sports hall in terms of x.
Express your answer in its simplest form. [4]

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(b) Find the dimensions of the sports hall when $x = 4{\cdot}5$. [2]

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Length = ... metres Width = ... metres

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(c) The area of the floor of a sports hall, in m^2, is given by the formula shown below.

$$\text{Area} = 6x^2 + 105x + 144$$

Calculate the area of the floor of the sports hall when $x = 4$. [2]

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Turn over for Question 8

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8. *Fisher Tours* has a new coach.



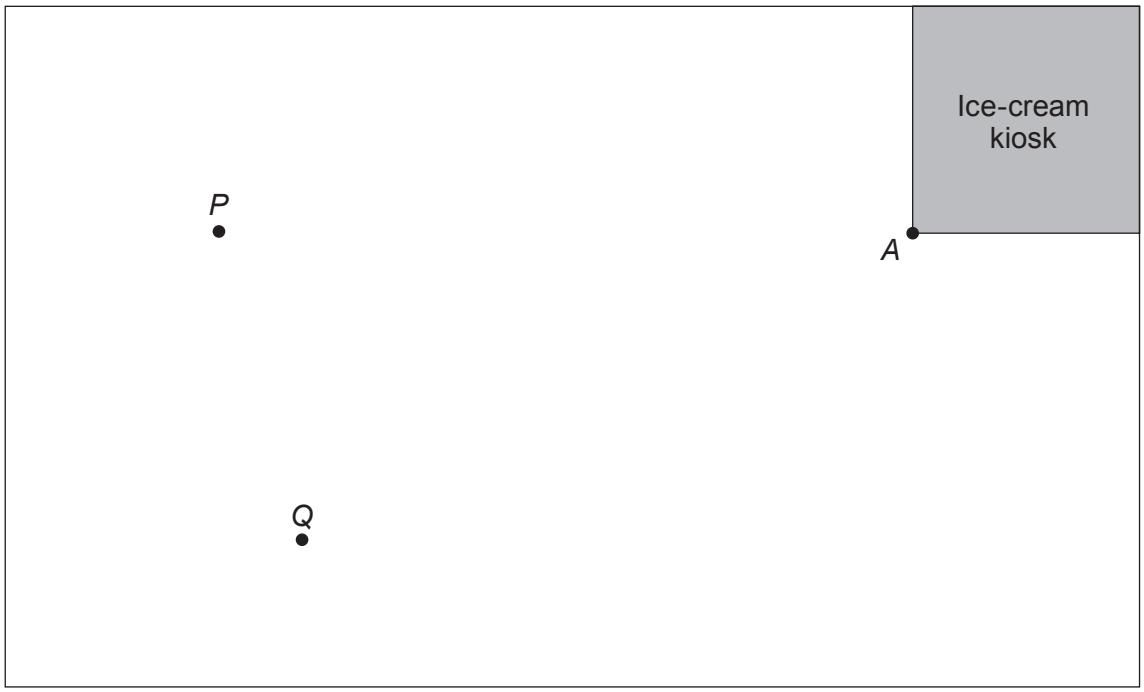
(a) On Sunday, the coach took 45 passengers on a trip to the zoo.
The ratio of men to women to children was 2 : 3 : 4.
How many children were on the coach? [2]

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(b) When *Fisher Tours* takes a coach trip to the zoo they must follow instructions for parking.
An accurate scale drawing of the entire coach-parking zone at the zoo is shown below.
Fisher Tours has been allocated a parking area within this parking zone.



Scale: 1 cm represents 4 metres

The instructions for parking are as follows:

- Must be further than 12 metres away from point *A* at the ice-cream kiosk.
- Must be closer to the lamp post *Q* than to lamp post *P*.

Indicate, on the scale drawing above, the region in which *Fisher Tours* can park their coach. [3]

5

END OF PAPER

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

W15-4361-01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. WEDNESDAY, 14 January 2015

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**9**	
3.	**2**	
4.	**3**	
5.	**10**	
6.*(a)(b)(c)(d)*	**7**	
6.*(e)(f)*	**3**	
6.*(g)*	**7**	
7.	**8**	
8.	**6**	
9.*(a)(b)*	**9**	
9.*(c)*	**2**	
10.	**8**	
Total	**80**	

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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.

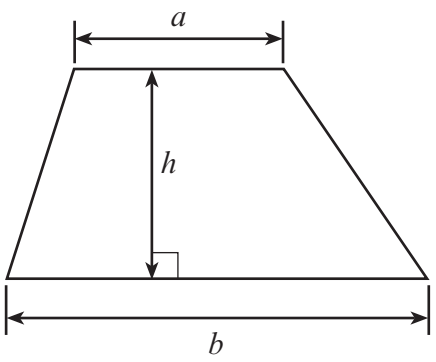
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2***(a)*.

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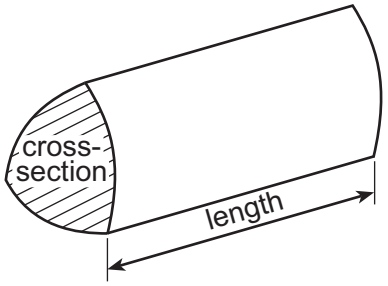
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Formula List

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



Volume of prism = area of cross-section × length



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1. *(a)* In December, 5738 people watched an international hockey match.
In a newspaper report, 5738 is written correct to the nearest 1000.

Write 5738 correct to the nearest 1000. [1]

.....

(b) At the hockey match, 1632 people were children under the age of 16.
Write 1632 correct to the nearest 100. [1]

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(c) At half-time, 4500 drinks were sold. Of these drinks, $\frac{4}{9}$ were cups of coffee.
How many cups of coffee were sold at half-time? [2]

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(d) Each of the 5738 people at the hockey match bought one raffle ticket.
Of the tickets bought, 3200 tickets were sold to people supporting the home team and the rest were sold to those supporting the away team.

One of the supporters said:

"The chance that the winner of the raffle will be a home supporter is equal to the chance that the winner will be an away supporter."

(i) Explain fully why this statement is incorrect. [1]

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(ii) What is the probability that the winner of the raffle is a home supporter? [1]

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Turn over.

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





On her birthday, Casey was given two gift vouchers for her favourite store.
One voucher was worth £25 and the other was worth £20.

She bought a pair of jeans for £26 and two tops for £15.99 each.

Casey used both of her vouchers when she bought the jeans and tops.
How much extra did she have to pay?
You must show all your working. [6]

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(b) Casey noticed that shops had gift vouchers in a variety of different shapes. One is shown below.

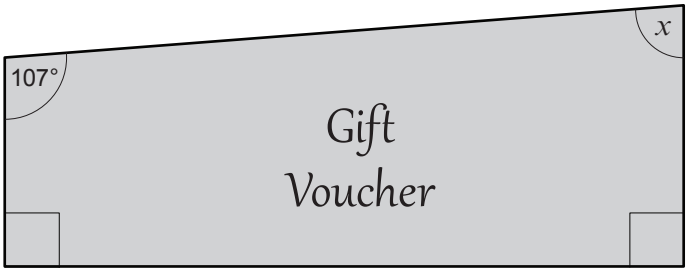


Diagram not drawn to scale

(i) Write down the special name given to each of the angles at the bottom of the gift voucher. [1]

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(ii) Find the size of angle x. [2]

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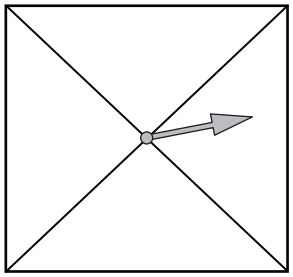
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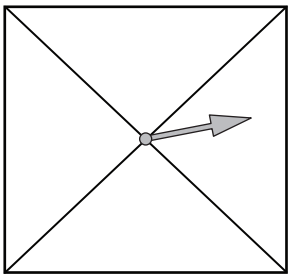
3. Jay and Alex design a game for their school fete. They each have a copy of a fair spinner as shown below.



The game is based on the probability of obtaining certain numbers on the spinner, when the spinner is spun once.

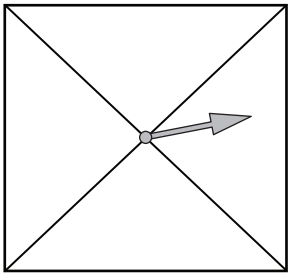
(a) Jay decides that she wants to place numbers on her spinner that would give an **even chance** of getting a number **greater than 4**.
Place 4 numbers on Jay's spinner to show this. [1]

Jay's Spinner



(b) Alex decides that he wants to place numbers on his spinner that would make it **certain** that you would get a number **less than 3**.
Place 4 numbers on Alex's spinner to show this. [1]

Alex's Spinner



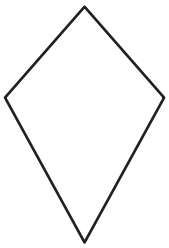
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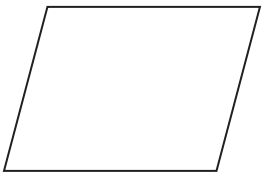
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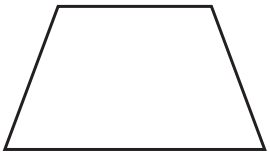
4. Daniel is asked to match the following quadrilaterals to statements that are given to him.
The quadrilaterals are



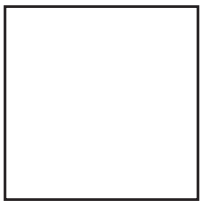
kite



parallelogram



trapezium



square

The statements that Daniel is given are in the table below.
Each quadrilateral can only be used once.

Match each statement to a quadrilateral. [3]

Statement	Quadrilateral
This quadrilateral has all 4 sides equal in length	
This quadrilateral has opposite sides equal in length	
This quadrilateral only has one pair of parallel sides	
This quadrilateral does not have any parallel sides	

4361 010007

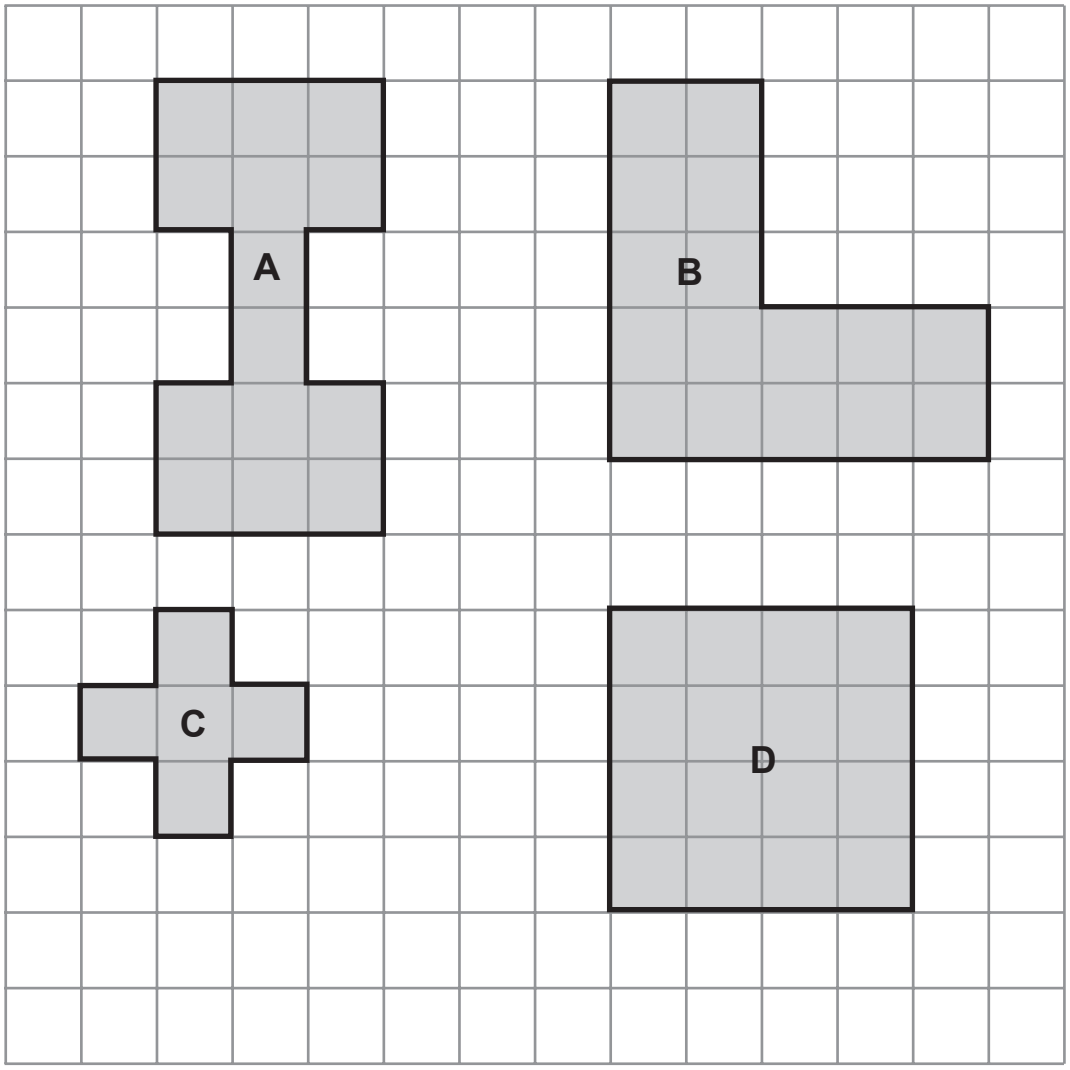
3

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5. *(a)* Plastic shapes are placed onto centimetre squared paper.



(i) Which 2 shapes have the same area? [2]

Shapes ..... and .....

(ii) Which shape has the largest perimeter?
Show all your working. [2]

.....

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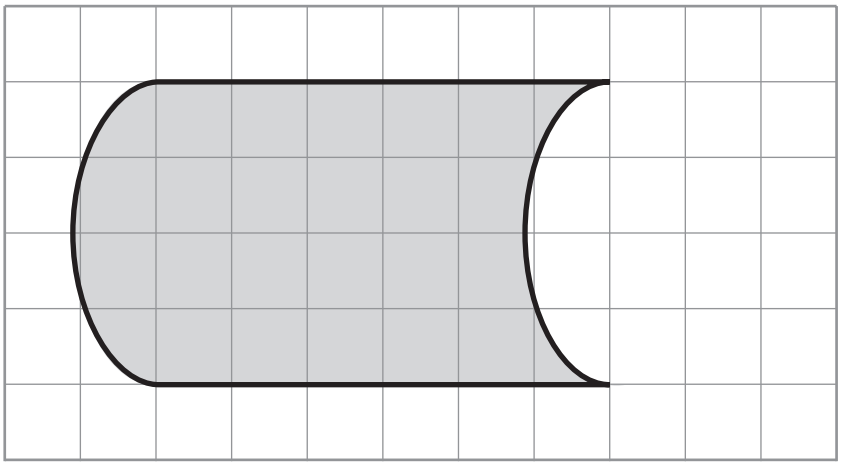
Shape .....

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(b) A different shape is placed on the centimetre squared paper.



Estimate the area of the shape.
State the units of your answer. [3]

.....

.....

.....

(c) An isosceles triangle is another different shape.
The side that is not equal in length to any other side is 9 cm long.
The angles that are equal are 55° each.
Draw this isosceles triangle accurately. [3]

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6. Last summer, Mr Williams had 10 tomato plants like the one shown below.



The number of tomatoes that grew on each plant is given below.

42 37 48 34 44 41 39 42 38 45

(a) Calculate the mean number of tomatoes per plant. [3]

.....

.....

.....

.....

(b) Find the median number of tomatoes per plant. [2]

.....

.....

(c) What is the modal number of tomatoes per plant? [1]

.....

(d) Next summer, Mr Williams plans to buy more tomato plants like the one above.

He says:

"On average, I should get about 41 tomatoes from each plant."

Give a reason why his data shows he is correct. [1]

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7

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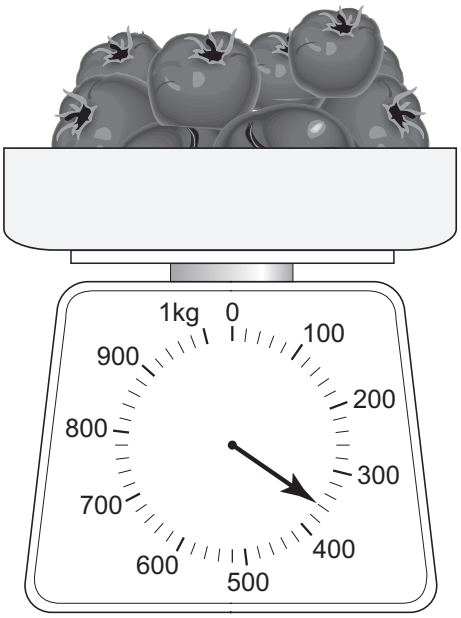
(e) When Mr Williams plants his tomato plants in his greenhouse, he has to leave a gap of 40 cm between each plant.
Given that 2·5 cm is approximately equal to 1 inch, change 40 cm into inches. [2]

.....

.....

.....

(f) Mr Williams decided to weigh some tomatoes.
What is the weight of the tomatoes? [1]



The tomatoes weigh ..... grams.

3

4361 010011

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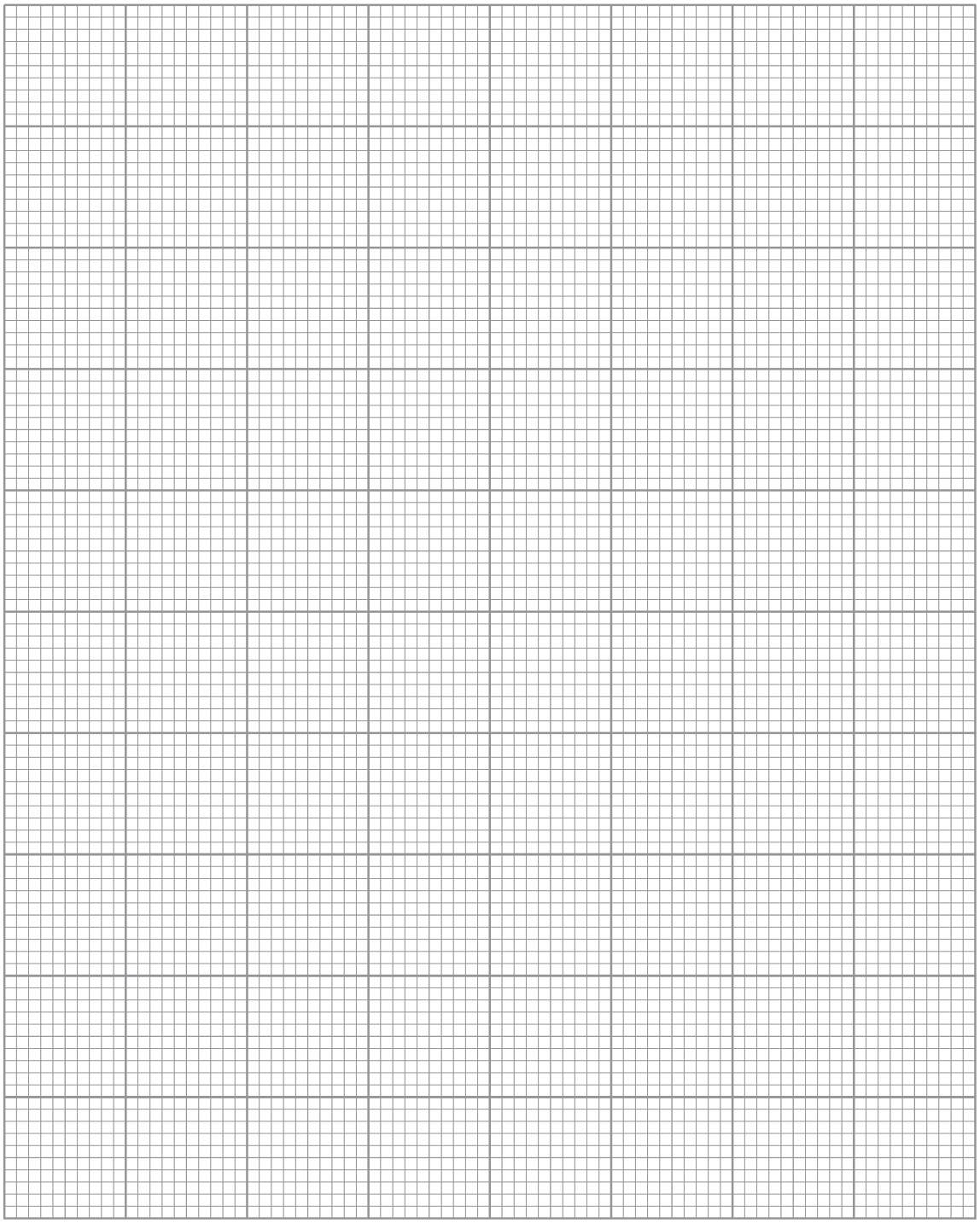
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(g) The temperature inside Mr Williams's greenhouse was recorded every three hours over a 24 hour time period. The results are shown in the table below.

Time	00:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00	24:00
Temperature (°C)	5	3	7	12	16	18	15	8	4

(i) Draw a time series graph to show the above information. [4]



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(ii) Describe clearly what the trend in the graph shows about the temperature in Mr Williams's greenhouse. [1]

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(iii) Calculate the range of the temperatures measured inside the greenhouse over the 24 hour period. [2]

.....

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7

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7. Graham and Lisa go on holiday to Copenhagen, Denmark.

(a) They need to change currency between pounds (£) and the Danish kroner (DKK).
They both go into the same currency shop.
Graham changes £200 and receives 1800DKK.
Lisa changes £300 and receives 2700DKK.

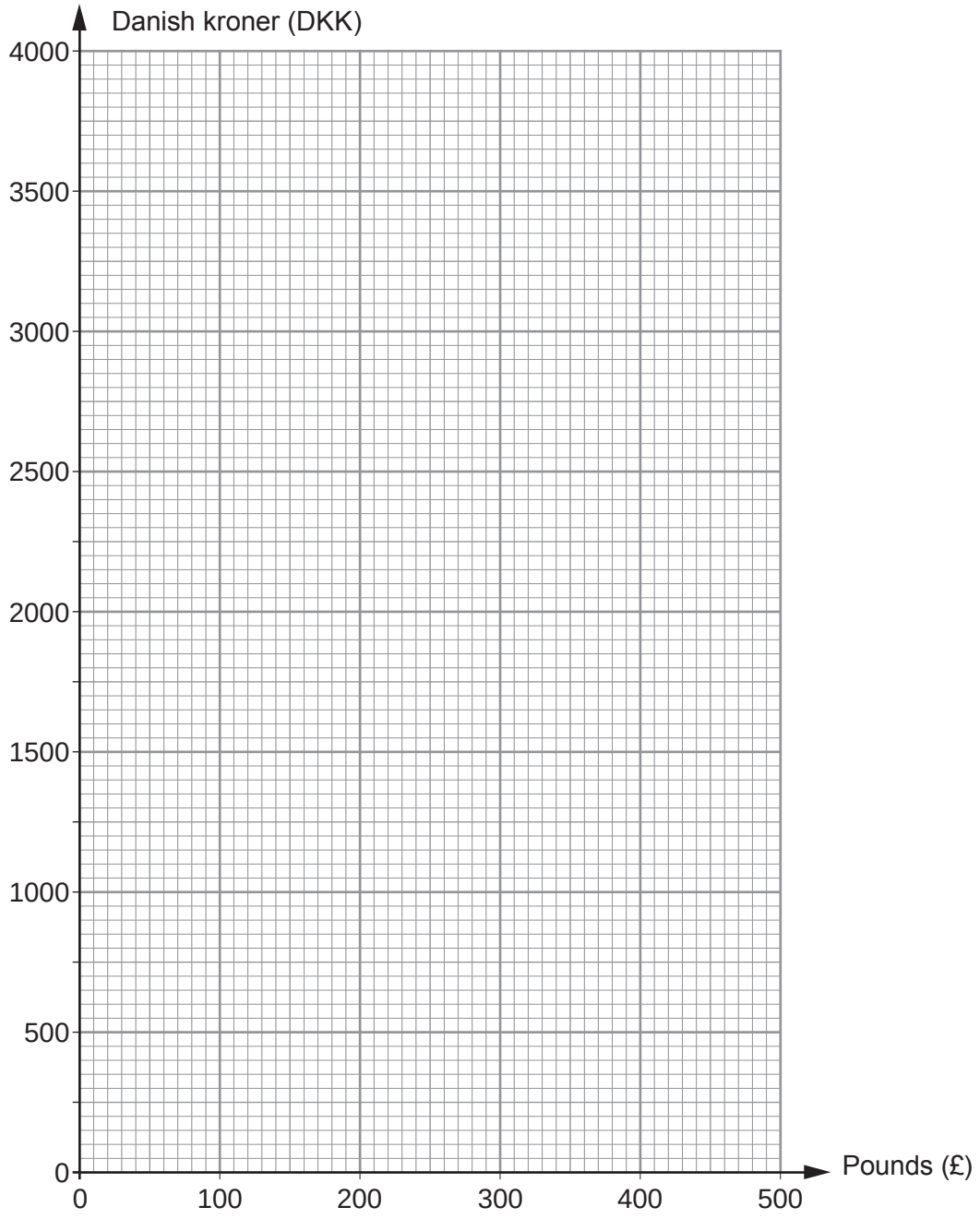
(i) Draw a conversion graph that can be used to change pounds (£) to Danish kroner (DKK). [2]

.....

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(ii) Explain how the graph can be used to find how many Danish kroner (DKK) are equivalent to £700.

.....

.....

.....

Complete the following sentence:

£700 is approximately ..... Danish kroner (DKK)

[2]

(b) Graham hires a car for the days that they are in Copenhagen.
The cost of hiring the car is £25 for the first day and then £18 for each additional day.
Graham pays £115 for hiring the car.
For how many days do they stay in Copenhagen?
You **must** show all your working. [4]

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8. *(a)*



Berlin's main railway station is known as the Hauptbahnhof.
Bellevue and Wildau are two railway stations in opposite directions from the Hauptbahnhof.

On a particular day,

- trains leave the Hauptbahnhof to Bellevue every 14 minutes
- trains leave the Hauptbahnhof to Wildau every 12 minutes.

A train to Bellevue and a train to Wildau both leave the Hauptbahnhof at 10:00.

When will a train to Bellevue and a train to Wildau next leave the Hauptbahnhof at the same time? [4]

(b) Raimund records the arrival time of the first 10 trains each hour.
A summary of his results is shown in the table below.

Time, after	Number of trains late	Number of trains on time or early
1 p.m.	2	8
2 p.m.	1	9
3 p.m.	5	5
4 p.m.	1	9
5 p.m.	3	7

Calculate the best estimate of the relative frequency of a train arriving late. [2]

6

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9. *(a)* Jack is planning to build a fence across his field.
He has placed a note on the sketch of his field to show where he intends to place the fence.

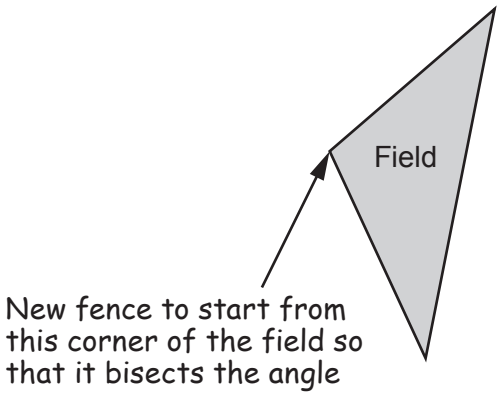
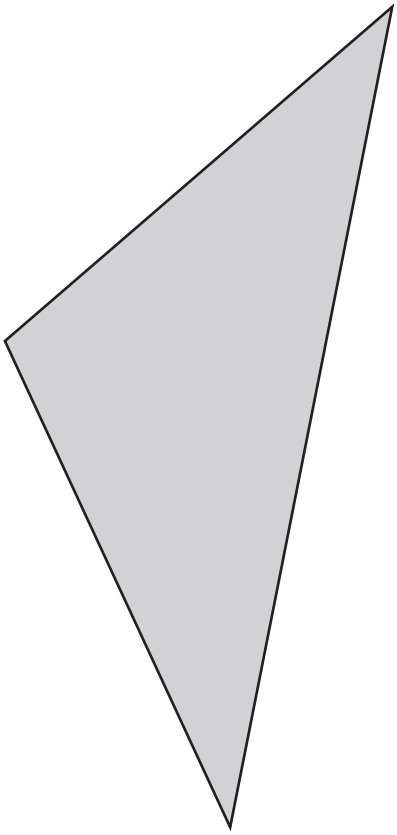


Diagram not drawn to scale

Complete the scale drawing below to show where the new fence is to be placed.
You must use a pair of compasses and a ruler to bisect the obtuse angle.
You must show all of your construction marks on the diagram. [2]



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(b) Jack employs two workers, Siân and Dan.
He pays each of them as follows:

- £3.75 each day they work, for checking the hedges and fences on the way to work
- £16.25 per hour when working with the animals
- £18.50 per hour when working with equipment, such as fork lift trucks and tractors.

(i) Siân works 3 days a week.
Last week she spent 4 hours each day working with animals and 2 hours each day using the fork lift truck.
How much was Siân paid last week? [3]

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(ii) Dan works 4 days a week.
He always spends y hours per day feeding the animals.
He always spends $2y$ hours per day driving the tractor.
Dan gets paid £P per week.
Write down a formula for P in terms of y.
Give your answer in its simplest form. [4]

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(c)



There is a duck pond on Jack's farm.

The duck pond is circular, with a diameter of 12 metres.
Calculate the surface area of the duck pond. [2]

.....

.....

.....

.....

.....

2

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10. Seven friends hire a boat, **The Wave**, to explore where dolphins swim.



The Wave

(a) The cost of hiring **The Wave** for a week is £2380.
Two sponsors, *Connelly Boats* and *Water Watch*, pay part of the hire cost.

The cost of hiring **The Wave** is shared in the ratio 2 : 3 : 5 with

- *Connelly Boats* paying the **smallest** share
- *Water Watch* paying the **largest** share
- The seven friends sharing the remaining cost equally.

How much does *Connelly Boats* pay?
How much does *Water Watch* pay?
How much does each of the seven friends pay?
You must show all your working. [6]

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(b) The charges for mooring boats are displayed in the harbour.

> Mooring charges for boats for 24 hours
>
> Mooring charges depend on the length of your boat.
>
> | | |
> |---|---|
> | Boats up to 6 m in length: | charge is £4.80 per metre |
> | Boats 7 m in length: | charge is £4.40 per metre |
> | Boats 8 m in length: | charge is £3.90 per metre |
> | Boats longer than 8 m: | charge is £3.55 per metre |
>
> Charge includes fresh water, electricity and use of the showers

The friends notice that, for boats between 6 m and 8 m in length, the charges were not very clear.

The Wave is 7·1 m in length.
The friends were charged £30.80 for mooring **The Wave**.

Explain how the charge was calculated and suggest how the charges could be displayed more clearly. [2]

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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 1
FOUNDATION TIER

<table>
<tr><th>Applications Unit 1 Foundation Tier
January 2015</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1.(a) 6000
(b) 1600
(c) 4/9 × 4500
2000
(d) (i) Correct reason given why statement is incorrect.

(ii) 3200/5738</td><td>B1
B1
M1
A1
E1

B1

6</td><td>

A correct statement that indicates more home supporters. Eg. “Because more tickets were sold to home supporters than away supporters.” “Only 2538 tickets were sold to away supporters.” “Not the same amount of tickets sold to home supporters and away supporters.” “3200 home and 2538 away.” “More home than away.”

</td></tr>
<tr><td>2. (a) (Spends) (£)26 + 2 × (£)15.99
(£)57.98
(Extra needed) (£)57.98 – (£)20 - (£)25
(£)12.98

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

(b) (i) Right angle
(ii) 360 – (90 + 90 + 107) or 180 – 107 or equivalent

73(˚)</td><td>M1
A1
M1
A1

Q
W
C
2

B1
M1

A1
9</td><td>

FT ‘their 57.98’

Alternative method
Uses one voucher to pay for the jeans so pays either £1 or £6 B1
Method for using other voucher for paying for the 2 tops
2 × (£)15.99 - 20 (or 25) OR 20 (or 25) - 2 × (£)15.99 M1
(pays) (£)11.98 or (£)6.98 A1
(spends) (£)12.98 B1

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.

Do not accept 90 ˚
For the intention of subtracting 3 given angles from 360 or for subtracting 107 from 180</td></tr>
<tr><td>3.

(a) Two numbers less than or equal to 4 AND two numbers greater than 4.
(b) Four numbers less than 3</td><td>

B1

B1

2</td><td>For both parts accept use of appropriate decimal or fractional values.
Eg 1, 2, 5, 6 OR 3, 4, 5, 6 OR 4, 4, 7, 7 etc

Eg 0, 0, 0, 0 OR 2, 1, 0, -1 etc</td></tr>
<tr><td>4.
<table><tr><th>Given Information</th><th>Quadrilateral</th></tr><tr><td>This quadrilateral has all 4 sides equal in length</td><td>Square</td></tr><tr><td>This quadrilateral has opposite sides equal in length</td><td>Parallelogram</td></tr><tr><td>This quadrilateral only has one pair of parallel sides</td><td>Trapezium</td></tr><tr><td>This quadrilateral does not have any parallel sides</td><td>Kite</td></tr></table></td><td>

B3

3</td><td>

Award B2 for 2 or 3 correct.
Award B1 for 1 correct.</td></tr>
</table>

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Applications Unit 1 Foundation Tier January 2015	Mark	Comment
5. (a)(i) Evidence of counting squares on at least 2 shapes Shapes B AND D (ii) Evidence of calculating perimeter of at least 2 shapes or the correct perimeter of one shape evaluated Shape A (b) Evidence of counting squares Answer in range 22 - 26 cm^2 (c) Correct triangle drawn with line of 9cm (±2mm) and 2 angles of 55°(±2°). 10	M1 A1 M1 A1 M1 A1 U1 B3	*(Area A=14, B=16, C=5, D=16)* Evidence may be seen on diagram *(Perimeter A=22, B=20, C=12, D=12)* Award SC1 for answer of A with no workings Award M1 for 6 × 4 Award A1 for 24 Independent mark Award B3 for a **complete** correct triangle Award B2 for 2 of the 3 measurements correct in a completed triangle OR all 3 correct but a **triangle** not completed Award B1 for 1 of the 3 measurements correct.
6. (a) Adding numbers (= 410) 410 ÷ 10 Mean = 41 (b) Put in order 34, 37, 38, 39, 41, 42, 42, 44, 45, 48 Median = 41.5 (c) Mode = 42 (d) Explanation given eg 'Yes because the mean is 41' or 'because all of the averages - mean, median and mode are about 41 or 42' 7	M1 m1 A1 M1 A1 B1 E1	Attempt to add numbers. Award M1 for sight of a value between 362 and 458 or sight of an answer from 35 – 48 as evidence of attempting to add FT 'their 410'÷ 10 CAO Sight of 41 and 42 only would gain M1 FT "their values". The explanation given must mention or imply the comparison of their averages or mean or median or mode.
6. (e) 40 ÷ 2.5 or equivalent 16 (inches) (f) 360 (grams) 3	M1 A1 B1	
6. (g)(i) Correctly labelled axes Uniform scales used All points plotted correctly Points joined with straight lines (ii) Explanation of graph given (iii) 18 – 3 15(°) 7	B1 B1 P1 L1 E1 M1 A1	 FT "their points". Accept solid or dotted lines. The explanation must imply that the temperature increase AND then decreases. Eg. "The temperature increases through the day and decreases through the evening." "It gets hotter during the middle of the day until the evening then goes down." Award E0 for explanations such as "The temperature at daytime rises."
7.(a)(i) Plotting at least two correct points Correct straight line through points (ii) Full explanation given using the graph Approximately 6300 (DKK) (b) 90 90 ÷ 18 5 days Total of 6 days 8	P1 L1 E1 B1 B1 M1 A1 B1	Accept (0,0) as one of the points plotted. CAO. If no clear evidence of points plotted but line is correct award P1 L1 Eg"he could find what £350 is and then double it". FT their graph Accept answers in the range 6200 – 6400 (DKK) May be seen or implied FT 'their 115 – 25' **Unsupported answer of 5 gets no marks.**
8.(a) Considering multiples of 12 and 14, e.g. sight of 12, 24, 36, .. AND 14, 28, 42, .., OR Looking at factors of 12 and 14, e.g. sight of 2×6 AND 2×7 Correct list of multiples of 12 to at least 72, or multiple 72 AND Correct list of multiples of 14 to at least 70, or multiple 70 , OR Sight of 2×6×7 Sight of 84 (as common multiple or number of minutes) Time 11:24 (b) 12/50 or equivalent (ISW) 6	S1 M1 A1 A1 B2	At least 3 correct multiples for both 12, 24, 36, 48, 60, 72, 84 14, 28, 42, 56, 70, 84 OR 1 hour 24 minutes FT time from 10:00 for their number of minutes provided S1 and M1 awarded *If no marks SC2 for an answer of 12(:)48, OR SC1 for sight of 2hours 48minutes* *No marks for sight of 168(minutes) alone.* B1 for sight of 12, or 'their attempt to sum number of trains'/50

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Applications Unit 1 Foundation Tier January 2015	Mark	Comment
9. (a) Appropriate arc(s) (dashes) shown on both lines, AND intersection arcs shown, using first set of arcs	M1	± 2 mm M0 if no arcs seen ± 2mm
Angle bisector drawn	A1	*SC1 if steps of process seen but slightly outside tolerance, OR SC1 if no arcs seen on the sides of the triangle but a correct set of arcs for the bisector shown*
(b)(i) 3×3.75 + 3 × (4 × 16.25 + 2 × 18.5(0))	M2	M1 for sight of the terms 3×3.75 and 4 × 16.25 + 2 × 18.5(0) (11.25) (65+37 = 102) OR M1 for sight of the terms 3 × 4 × 16.25 and 3× 2 × 18.5(0)) (195) (111) OR M1 for 3.75 + 4 × 16.25 + 2 × 18.5(0) (= 105.75)
(Sian's pay is 11.25 + 195 + 111 = £) 317.25	A1	FT from M1
(ii) 4 × 3.75 (= 15)	B1	May be seen in stages of working
(4 ×) 2y × 18.5(0) + (4 ×) y × 16.25	B2	Must be as an expression or formula of at least 2 terms which may have been simplified, OR B1 for either term correct in an expression of at least 2 terms
P = 15 + 213*y*	B1	CAO. Must be a formula ISW *If no marks allow SC1 for P = 12y (+15)*
	9	
9. (c) $\pi \times 6^2$ Between 113.04 to 113.1(43m^2) inclusive, or 113(m^2)	M1 A1	Ignore incorrect rounding or truncation if a correct response is seen. Accept 36π (m^2) as the final answer
	2	
10. (a) 1 share seen or implied 2380 ÷10 or 238	B1	
(Connelly Boats pay) 2380 ×2 ÷10 **OR** (Water Watch pay) 2380 ×5 ÷10	M1	B1 implied if both appropriate calculations seen
(Connelly Boats pay £) 476	A1	If these answers are unlabelled they must be in the correct order
(Water Watch pay £) 1190	A1	
(The 7 friends altogether have to pay £) 714	B1	FT 2380 minus the sum of their Connelly Boats and Water Watch payments, i.e. 2380 – 'their 476' – 'their 1190' correctly evaluated
(Each of the seven friends has to pay 714 ÷ 7) (= £) 102	B1	CAO depends on the award of all previous marks
(b) Sight of 7× 4.40 (= £ 30.80) OR clear description e.g. "They have rounded the length to 7m and charged them for that"	B1	*Allow 30.80 ÷ 7 = 4.4(0) or 30.80 ÷ 4.4(0) = 7* *Do not allow they were charged 4.4(0) per metre*
Suggestion how the charges could be displayed more clearly, e.g. 'sign should include '*to the nearest metre*' or 'boats between 6.5 and 7.5 charged …	E1	*Need to show appreciation of the rounding for E1 e.g. "Give the total costs on the display so £30.80 for a 7m boat" is insufficient* *Accept 6-5 – 7.5(m) charged £4.40 per (whole) m or equivalent.* *Accept only suggestions that keep the cost for 7.1m as £30.80 e.g. 'boats between 6 and 8 m long are charged £4.40 per m'* *Do not allow suggestions that lead to changes in the costs displayed for example: 'boats 7 to 8 (m) are charged…' is E0* *Ignore suggestions that do not relate to the costs for 7.1m*
	8	

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APPLICATIONS UNIT 1
HIGHER TIER

Applications Unit 1 Higher Tier January 2015	Mark	Comment
1(a) Considering multiples of 12 and 14, e.g. sight of 12, 24, 36, .. AND 14, 28, 42, .., OR Looking at factors of 12 and 14, e.g. sight of 2×6 AND 2×7	S1	At least 3 correct multiples for both
Correct list of multiples of 12 to at least 72, or multiple 72 AND Correct list of multiples of 14 to at least 70, or multiple 70 , OR Sight of 2×6×7	M1	12, 24, 36, 48, 60, 72, 84 14, 28, 42, 56, 70, 84
Sight of 84 (as common multiple or number of minutes) Time 11:24	A1 A1	OR 1 hour 24 minutes FT time from 10:00 for their number of minutes provided S1 and M1 awarded *If no marks SC2 for an answer of 12(:)48, OR SC1 for sight of 2hours 48minutes* *No marks for sight of 168(minutes) alone.*
(b) 12/50 or equivalent (ISW)	B2 6	B1 for sight of 12, or 'their attempt to sum number of trains'/50
2(a) Appropriate arc(s) (dashes) shown on both lines, AND intersection arcs shown, using first set of arcs	M1	± 2 mm M0 if no arcs seen ± 2mm
Angle bisector drawn	A1	*SC1 if steps of process seen but slightly outside tolerance, OR SC1 if no arcs seen on the sides of the triangle but a correct set of arcs for the bisector shown*
(b)(i) 3×3.75 + 3 × (4 × 16.25 + 2 × 18.5(0))	M2	M1 for sight of the terms 3×3.75 and 4 × 16.25 + 2 × 18.5(0) (11.25) (65+37 = 102) OR M1 for sight of the terms 3 × 4 × 16.25 and 3× 2 × 18.5(0)) (195) (111) OR M1 for 3.75 + 4 × 16.25 + 2 × 18.5(0) (= 105.75)
(Sian's pay is 11.25 + 195 + 111 = £) 317.25	A1	FT from M1
(ii) 4 × 3.75 (= 15) (4 ×) 2y × 18.5(0) + (4 ×) y × 16.25 P = 15 + 213*y*	B1 B2 B1 9	May be seen in stages of working Must be as an expression or formula of at least 2 terms which may have been simplified, OR B1 for either term correct in an expression of at least 2 terms CAO. Must be a formula ISW *If no marks allow SC1 for P = 12y (+15)*
2(c) $\pi \times 6^2$ Between 113.04 to 113.1(43m^2) inclusive, or 113(m^2)	M1 A1	Ignore incorrect rounding or truncation if a correct response is seen. Accept 36π (m^2) as the final answer
(d) (1 revolution measures) 2 × π × 0.24 × 32 or × 14 (West field) 48.2 to 48.3(2m), or 48(m) AND (Storage building) 21.(1…m)	M1 m1 A1 5	May be embedded in working (C = 1.507…m)

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Applications Unit 1 Higher Tier January 2015	Mark	Comment
3(a) 1 share seen or implied 2380 ÷10 or 238 (Connelly Boats pay) 2380 ×2 ÷10 **OR** (Water Watch pay) 2380 ×5 ÷10 (Connelly Boats pay £) 476 (Water Watch pay £) 1190 (The 7 friends altogether have to pay £) 714 (Each of the seven friends has to pay 714 ÷ 7) (= £) 102	B1 M1 A1 A1 B1 B1	B1 implied if both appropriate calculations seen If these answers are unlabelled they must be in the correct order FT 2380 minus the sum of their Connelly Boats and Water Watch payments, i.e. 2380 – 'their 476' – 'their 1190' correctly evaluated CAO depends on the award of all previous marks
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) Sight of 7× 4.40 (= £ 30.80) OR clear description e.g. "They have rounded the length to 7m and charged them for that" Suggestion how the charges could be displayed more clearly, e.g. 'sign should include '*to the nearest metre*' or 'boats between 6.5 and 7.5 charged …	B1 E1 10	*Allow 30.80 ÷ 7 = 4.4(0) or 30.80 ÷ 4.4(0) = 7* *Do not allow they were charged 4.4(0) per metre* *Need to show appreciation of the rounding for E1 e.g. "Give the total costs on the display so £30.80 for a 7m boat" is insufficient* *Accept 6-5 – 7.5(m) charged £4.40 per (whole) m or equivalent.* *Accept only suggestions that keep the cost for 7.1m as £30.80 e.g. 'boats between 6 and 8 m long are charged £4.40 per m'* *Do not allow suggestions that lead to changes in the costs displayed for example: 'boats 7 to 8 (m) are charged…' is E0* *Ignore suggestions that do not relate to the costs for 7.1m*
3(c) (i) 110° drawn from harbour 320° drawn from the position of buoy 1 055° drawn from the position of buoy 2 Line 10cm OR 6cm OR 2.5cm for the appropriate stage Accurate chart with lengths and angles correct (ii) 290° (iii) Distance (±2mm) from the position of buoy 3 to the harbour Bearing (±2°) from the position of buoy 3 to the harbour (d) Lines following the shape of coast line at 5km An arc of radius 20km from Funchal Perpendicular bisector (Ribeira Brava and Santa Cruz) Appropriate region indicated	 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 12	Accept 'their North' provided ±2° from the North given. Penalise 'their North' outside of this tolerance once only ±2° ±2° ±2° ±2mm Within tolerances allowed ±2°. FT from their diagram ±2° FT from their diagram (Actual is approximately 8 × 60 = 480 m) FT from their diagram (Actual is approximately 250°) 1cm ± 2 mm 4cm ± 2mm ±2° FT for region provided at least B2 previously awarded with an attempt at all three conditions
3(e)(i) 33 × 12 + 4 (=400 inches) ÷ 0.3937 (or × 2.54) 1016(.002….cm) or 1020(cm) (ii) 10160 | $1(.016\ldots) \times 10^4$	M1 m1 A1 B1 B1 5	*Allow M1 if 33 × 12 and an additional 4 seen in the working* Do not accept ×2.5 Left entry, 10160(.02) or 10200 or FT 10× 'their (e)(i)' Right entry, $1(.016\ldots) \times 10^4$. FT from use of 'their 10160'

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Applications Unit 1 Higher Tier January 2015	Mark	Comment
4(a)(i) Implies or states 'no' with a valid reason, e.g. 'No as 810 minutes is less than 15 hours'	B1	(For information 810mins = 13.5 hrs, 900mins = 15hrs) Any calculations shown must be correct
(ii) Mid-points 45, 135, 225, 360, 630 45×10 + 135×38 + 225×20 + 360×8 + 630×4 (450 + 5130 + 4500 + 2880 + 2520 = 15480) ÷80 193.5	B1 M1 m1 A1	FT their mid-points including bounds. Allow 1 slip in their mid-points outside boundaries if otherwise correct method FT their $\Sigma fx/80$ Accept 193 or 194 if correct working is seen
(iii) 10 | 48 | 68 | 76 | 80	B1	
(iv) Correct cumulative frequency diagram, points plotted at upper bounds and joined by a curve or straight line	B2	FT from cumulative (iii). Must show initial plot at the origin. B1 for points correct but not joined, OR B1 correct apart from 0.5 translation, OR B1 if one error in plotting but joined correctly
(v) Median 160 Intention to subtract readings from horizontal axis for vertical 60 & 20 Interquartile range from diagram	B1 M1 A1 11	FT from their cumulative diagram. Not cumulative no FT FT from their cumulative diagram.
4(b)(i) Range ends 50 and 800 correctly indicated with 'whiskers' Within a box: Median line correctly indicated LQ correctly indicated UQ correctly indicated	B1 B1 B1 B1	There must be a box drawn for these three marks, not vertical lines only.
(ii) Suitable comparison statement for medians Suitable comparison statement for IQR Conclusion, e.g. 'Don't agree because….'	M1 M1 A1	FT their (a)(v) median IQR Thursday is 360, and FT their (a)(v) IQR Depends on first M1 Accept 'Don't agree' OR 'No' 'because on average Thursday is higher' Ignore extra comment based on the IQR providing it does not contradict their conclusion based on the median. If no marks awarded SC1 for 'Cannot decide as we do not know if these are a typical Thursday and a typical Wednesday'.
(c)(i) Reason that implies 'like with like' comparison, i.e. always includes the full set of days or because a 7 point moving average will provide an average for the week	E1	Do not accept 'because there are 7 days in a week' or 'using the whole week's data' without further explanation *Accept statements such as "the results then show the viewing figures for a week"*
(ii) 4.27, 4.30, 4.34, 4.40, 4.33 (million)	B4 12	'0' representing hundredths must be shown as appropriate B3 for 4.27…. , 4.3, 4.34…, 4.4, 4.32857… (million) rounded or truncated, B2 for any three correct moving averages, rounded or truncated, B1 for a correct method seen, or 1 correct moving average (29.9/7, 30.1/7, 30.4/7, 30.8/7, 30.3/7)
4(d)(i) Correct histogram	B3	Accept missing labels for B2 or B1 B2 for sight of 0.06, 0.36, 0.24, 0.02 and 0.02 or histogram with at least 3 bars correct, OR B1 for histogram with any 1 bar correct, or for a suitable frequency density scale, uniform to a least 0.36
(ii) Median (76 + 1)/2 or 76/2 Attempt to identify 1/9 or 8/9 of the second bar Correct identification of the median	B1 B1 B1	FT from their histogram if possible Could also be 32.5/36 or 3.5/36 *Allow, in the answer space or indicated on the histogram the calculated value of 188.888…OR 190.2777 (people) truncated or rounded.*
(e)(i) 200×0.1 + 100×0.4 + 100×0.6 + 400 × 0.15 180 (people)	M2 A1	M1 for any 3 correct area calculations (20+40+60+60) FT for a summation of their 4 values provided M1 awarded
(ii) 200×0.1 + ½× 100×0.4 40 (people)	M1 A1 11	FT their values from (i)

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Applications Unit 1 Higher Tier January 2015	Mark	Comment
5(a) Strategy, e.g. to draw a tangent at 7.5 seconds	S1	
Use of difference v / difference t	M1	Must be differences, not readings from axes. Ignore signs
= 0.4 to 0.6	A1	Reasonable from their graph. *Allow a fraction for example 4/7*
m/s^2 or m per s^2	U1	Does not depend on previous marks Maybe shown on their graph
(b) Identifying the required area	S1	
Splitting area into areas that can be approximated	M1	Must include at least 1 calculation for an appropriate area, or correct statement of the trapezium rule
Complete calculation for the area required	M1	OR correct substitution into the trapezium rule, allow 1 slip
Accurately calculated area	A1 8	(Possible answers around 195 to 215 metres)

t	0	1	2	3	4	5	6	**6.4**	7	8	9	10
H	0	4.9	19.6	44.1	78.4	122.5	176.4	**200**	240.1	313.6	396.9	490

t	0	10	20	30	40	50	60
H	0	490	1960	4410	7840	12250	17640

6(a) Suitable uniform scales on labelled axes	B2	Scale for H does not extend beyond 400(m) B1 on labelled scale for H extends beyond 400(m) Award B1 for correct scales and one label missing.
At least 6 correct values calculated (or plotted) which could produce an appropriate curve.	B2	For example including values of H for t = 3, 4, 5, 6, (7) OR values of t for H = 175 and 200 B1 for 2, 3, 4 or 5 correct values calculated
At least 6 correct values plotted AND joined with a curve that includes H = 200	C1	No incorrect values plotted
(b) Check reading for their graph:		MUST FT their graph, **not** for calculation (Calculated values are 30.625 and 132.496) FT only from derived points or values.
from graph ≈28 to 33 — e.g 3×10^{-2} , 3.1×10^{-2}	B1	For both readings correct for their graph
from graph ≈ 130 to 135 — e.g 1.32×10^{-1}, 1.33×10^{-1}	B1	FT expressed in km in standard form *If no marks, SC1 for one correct reading from their graph, as km and correctly given in standard form*
(c) Suggests error due to river level changing or other suitable reason, or that the time taken was not accurately measured, or not drop from consistent level on the bridge, or rivers were not all horizontal, or different river levels, or windy, or air resistance neglected , or…	E1	Allow comparison that implies the stones are different
(d) $496 = ½ \times 9.8 \times t^2$	M1	
$t^2 = 101.2244898…$	A1	*Accept (t between) 10 and 10.1 from use of trial and improvement*
t = 10(.06…seconds)	A1 11	CAO

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. FRIDAY, 13 June 2014

1 hour 30 minutes

4361
010001

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***(a)*.

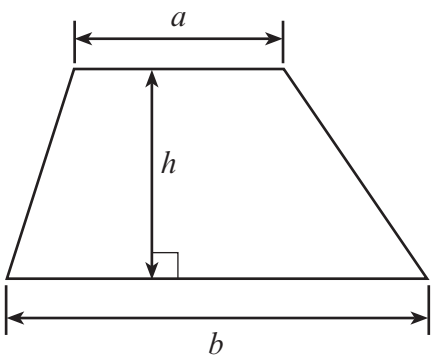
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**12**	
2.	**7**	
3.	**9**	
4.(a)	**10**	
4.(b)(c)	**7**	
5.	**7**	
6.	**5**	
7.	**4**	
8.	**4**	
9.	**7**	
10.	**8**	
Total	**80**	

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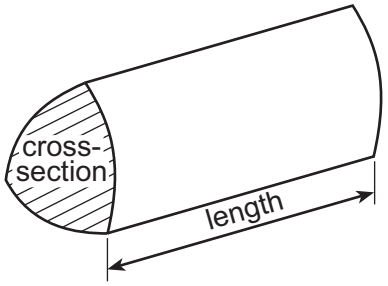
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Formula List

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



Volume of prism = area of cross-section × length



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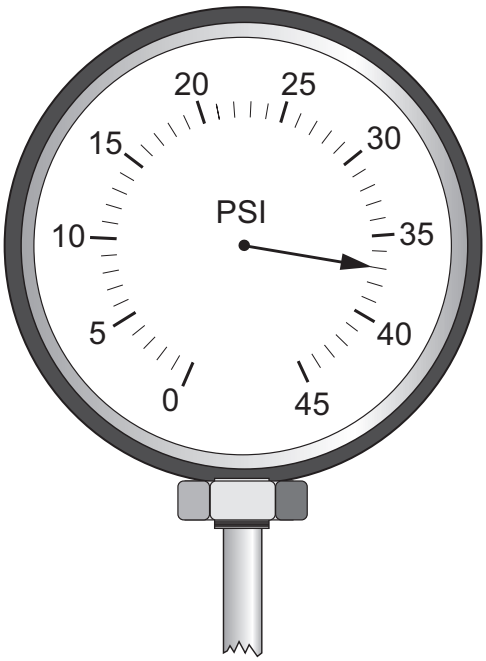
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1. *(a)* Tyre pressure is measured in PSI (pounds per square inch).
The pump in the diagram shows the pressure in a tyre of a bicycle.
What is the pressure in the tyre? [1]



Pressure in the tyre is ..... PSI

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(b) The sketch below represents part of a cycle route.

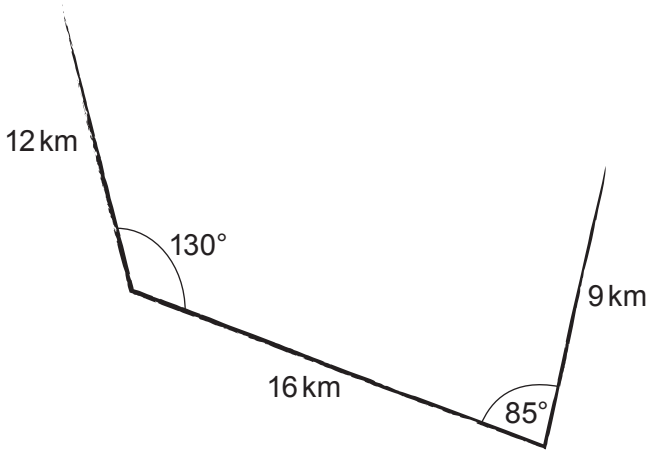
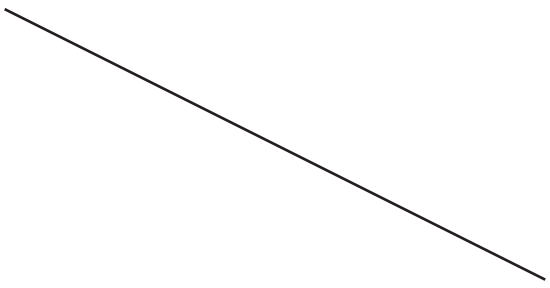


Diagram not drawn to scale

Draw an accurate diagram for the part of the cycle route shown.
Use a scale of 1 cm to represent 2 km.
The line representing the 16 km has already been drawn for you. [4]



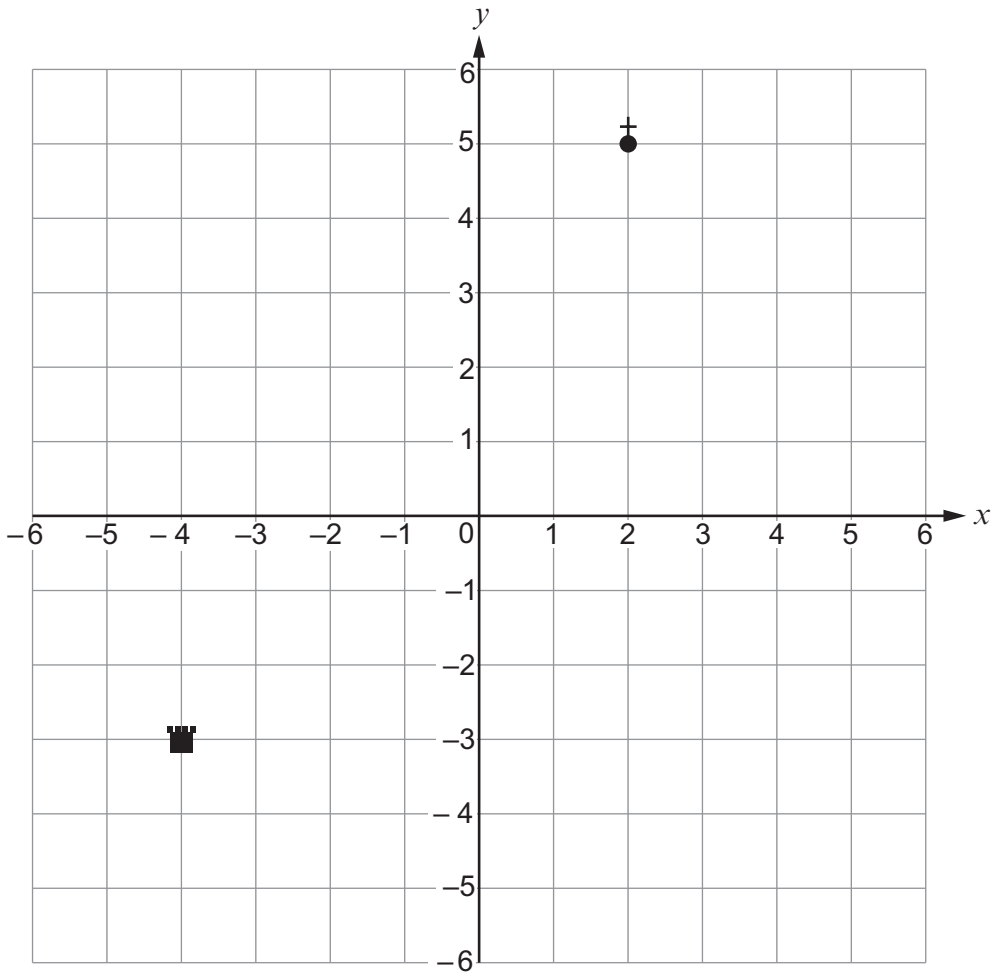
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(c) Several places can be seen from the cycle route.

A church ✝ and castle ♜ are shown on the grid below.



(i) What are the coordinates of the church and castle shown on the grid? [2]

The coordinates of the church are (..... , ...)

The coordinates of the castle are (..... , ...)

(ii) A skating park can also be seen from the cycle route.
The coordinates of the skating park are (3, 0).
Plot this point on the grid above and label the point S. [1]

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(d) The average times to cycle between these places are given in the table below.

	Church	**Castle**	**Skating park**
Church		1·5 hours	20 minutes
Castle	1·5 hours		$\frac{3}{4}$ hour
Skating park	20 minutes	$\frac{3}{4}$ hour	

Use the times given above to answer the following.

(i) How long does it take to cycle from the castle to the skating park?
Give your answer in minutes. [1]

.....

.....

..... minutes

(ii) How long, **in total**, will it take to cycle
- from the castle to the skating park
- then from the skating park to the church
- and finally from the church back to the castle? [3]

.....

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2.



Christopher is tiling his kitchen walls.

(a) He needs 25 boxes of tiles.
The price of one box is £27.60.
The tile shop has a special offer of

Buy one box and get another box half price

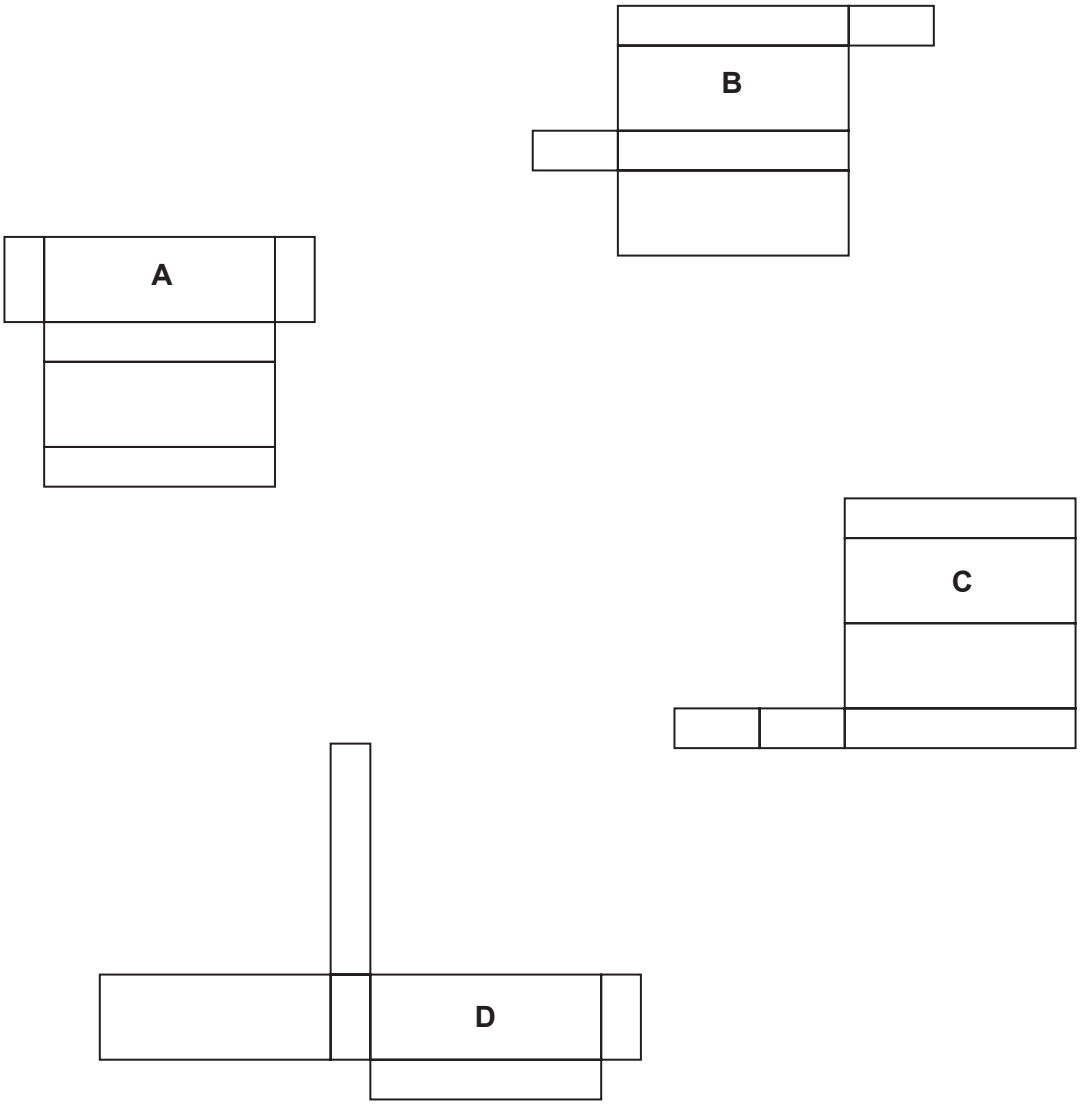
Christopher makes use of this special offer.
How much does Christopher pay for the 25 boxes of tiles? [5]

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(b) The boxes that contain the tiles are cuboids.
Circle the possible **nets** that could be used to form the boxes for the tiles. [2]



4361 010009

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3. Jimmy recorded the following 7 waiting times, in minutes, for meals at a local restaurant.

17 24 19 30 19 25 20

(a) Find the mean, median, mode and range of the 7 waiting times. [7]

Mean

Median

Mode

Range

(b) Jimmy recorded an extra waiting time at the restaurant.
This made the range of the 8 waiting times equal to the mode of the 8 waiting times.
Find a possible value for this extra waiting time. [2]

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

A committee organised an end of Year 11 party in a local hotel.

The costs for the party were:

- A room hired for 5 hours at a cost of £24 per hour.
- A band hired at a cost of £165 for the evening.
- Balloons and decorations for the room at a cost of £356.
- A meal at a cost of £27 per person.

The tickets for the party were sold at £35 each.
154 tickets were sold.

After the committee had paid all of the costs for the party, the money left over was given to a charity.
How much money was given to the charity?
Show all your working. [10]

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(b) The dance floor was in the shape of a rectangle, as shown below.

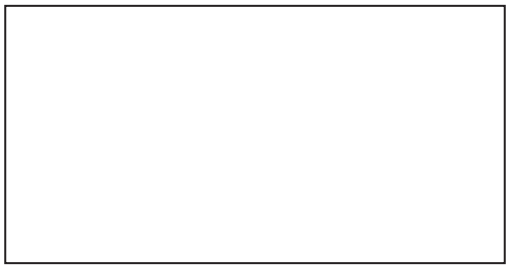


Diagram not drawn to scale

Calculate the area of the dance floor, giving the units of your answer. [3]

.....

.....

.....

(c) The cost of hiring a limousine for the party is calculated using

£295
plus
£2.80 per mile

(i) Calculate the cost of hiring a limousine for travelling a distance of 20 miles. [2]

.....

.....

.....

(ii) Write a formula for the cost of hiring a limousine.
Use C for the cost, in pounds, and m for the distance, in miles. [2]

.....

.....

.....

.....

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5. A new logo for a sports club has been designed to go onto their kit.
The design consists of **two squares** joined to **an equilateral triangle** as shown below.

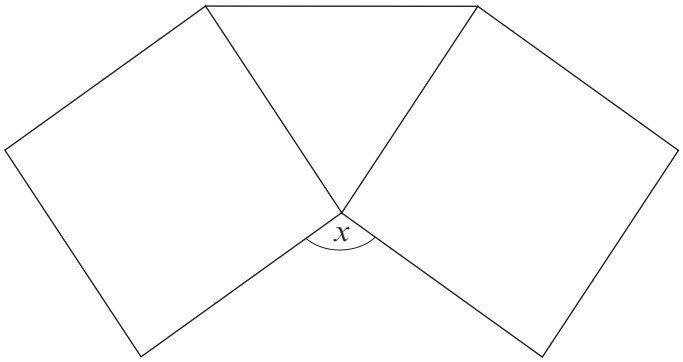


Diagram not drawn to scale

(a) Each square has sides of length 27 mm.
Find the perimeter of the logo, **giving your answer in cm**. [4]

.....

.....

.....

.....

(b) Find the size of angle x. [3]

.....

.....

.....

.....

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6. *(a)* Red and green buoys are used to aid navigation of boats. They often have flashing lights placed on them.
Whilst out sailing, Dewi notices that the light on a green buoy flashes every 8 seconds and the light on a red buoy flashes every 6 seconds.
Dewi sees them flash at the same time.
How many seconds later will he see the lights flash together again? [2]

.....

.....

.....

.....

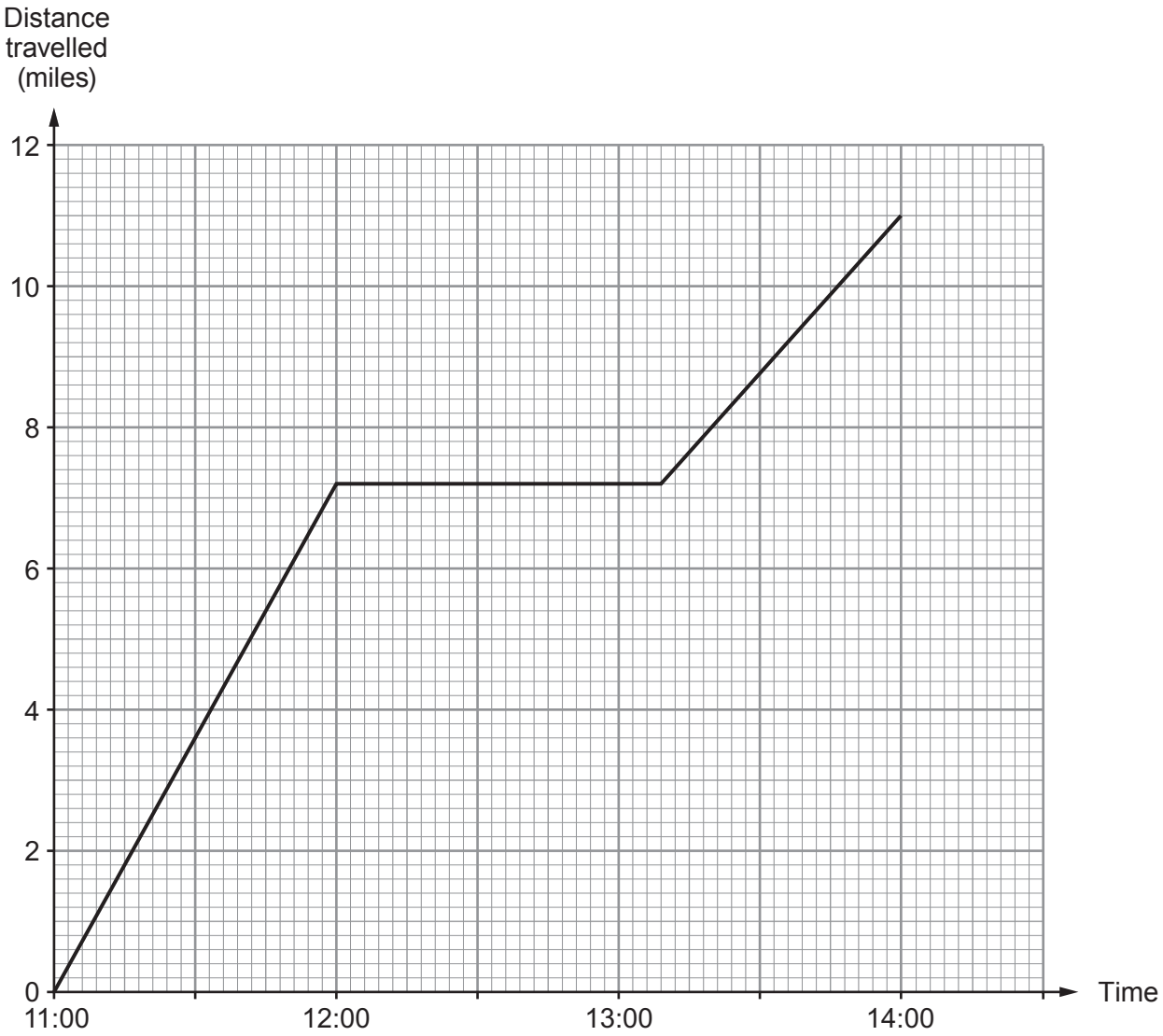
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(b) The travel graph below represents Dewi's journey whilst sailing.



(i) How far did he travel in the first half hour? [1]

.....

(ii) Dewi stops for lunch and drops the anchor to stop his boat from drifting. For how many minutes did he stop? [1]

.....

.....

(iii) Without carrying out any calculations, decide whether Dewi is travelling faster before or after his stop. You must give a reason for your answer. [1]

.....

.....

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Turn over.

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7. A survey is to be carried out to find the popularity of buying books with various age groups of the general population.

The survey is carried out by asking people questions as they come out of a book shop.
Two questions from the survey questionnaire are shown below.

1. How old are you?
Put a tick in the box.

under 20	☐
20 to 30	☐
30 to 40	☐
older than 40	☐

2. Do you buy books?
Put a tick in the box.

Yes	☐
No	☐

(a) Explain why this may be a biased survey. [1]

.....

.....

.....

(b) State a criticism about the design of question 1 in the survey. [1]

.....

.....

.....

(c) Write a question with a selection of answer boxes, to find out how much people are prepared to pay for a paperback book. [2]

.....

.....

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8. Bikes are built around a frame.



Below is a scale drawing of a bike frame.

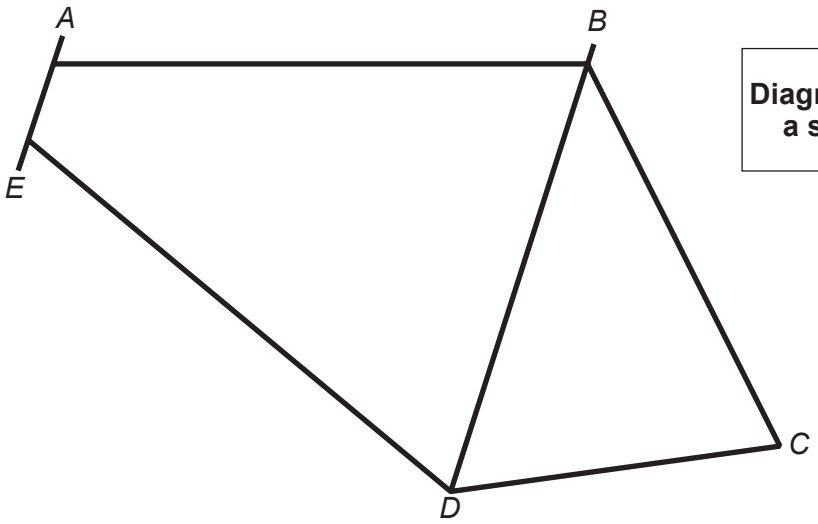


Diagram drawn to a scale of 1:8

(a) Write down an approximate length of the cross bar *AB*.
Give your answer in **metres**. [2]

.....

.....

.....

.....

(b) Is *AE* parallel to *BD*?
Use angle facts to give a reason for your answer. [2]

.....

.....

.....

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Turn over.

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9. *(a)* Jasmine makes necklaces.
Each necklace is made using 34 red beads, 10 yellow beads and 6 black beads.

Jasmine has 918 red beads.
She does not have any yellow or black beads.
Jasmine plans to use all her red beads to make necklaces.

How many yellow and black beads does Jasmine need to buy?
You must show all of your working. [4]

(b) Jasmine also makes bracelets.
Each bracelet is made using 24 purple beads and 9 green beads.
Jasmine buys her beads in bags of 6 purple beads and bags of 6 green beads.
She wants to buy the smallest number of bags of beads and **must** use all the beads she buys.
How many bags of purple beads and green beads does Jasmine need to buy? [3]

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10. Lizzie's job is to calculate solutions for a data analysis company which involves working with algebraic equations and expressions.

Process the following for Lizzie.

(a) Factorise $35x + 15$. [1]

(b) Simplify $3a + 5b - 19a - 16b$. [1]

(c) Simplify $3(3d - 2e) - (d - e)$. [2]

(d) Lizzie knows that a solution to the equation $x^3 - 2x - 40 = 0$ lies between 3 and 4. Find this solution correct to one decimal place. [4]

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

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UNIT 1 (FOUNDATION TIER)

Applications Unit 1 Foundation Tier June 2014	Mark	Comment
1. (a) 37	B1	
(b) 85˚ drawn	B1	±2˚
130˚ drawn	B1	±2˚
Line of 6cm AND 4.5cm drawn	B2	±2mm B1 for line of 6cm OR 4.5cm drawn or indicated. Within tolerances allowed
(c)(i) Church (2, 5)	B1	Reverse coordinates B0 throughout (c)
Castle (-4, -3)	B1	
(ii) Skating park (S) plotted at (3, 0)	B1	Accept any indication of (3, 0)
(d) (i) 45 (minutes)	B1	
(ii) ¾ (hours) + 20 (mins) + 1.5 (hours)	M1	For adding the 3 times given. FT 'their 45 minutes'
Changing all to hours OR all to mins correctly	B1	Either 45 + 20 + 90 OR ¾ + $^1/_3$ + 1.5 or equivalent
155 mins or 2 hrs 35 mins or 2.58(3....)hours ISW	A1	Do not accept 0.3 for 1/3 for A1 but allow for B1 If units used they must be correct. Do not accept 2.35 but allow 2:35
	12	
2. (a) Working towards 13 & 12 boxes or Engaging with buy 1 get 1 half price	S1	
13 × (£)27.6(0) or 12 × (£)13.8(0)	M1	
(£)358.8(0)	A1	
(£)165.6(0)	A1	
(£)524.4(0)	A1	FT 'their (£)358.8(0)' + 'their (£)165.6(0)'
		If M0 awarded allow SC1 for sight of (£)13.8(0). Possible S1 can still be awarded.
		Alternative method: *Cost of 2 boxes = 1.5 × £27.60 B1* *∴ cost of 24 boxes* *= 12 × 1.5 × £27.60 = 496.80 M1A1* *Total cost including 25th Box* *= 27.60 + 524.40 M1 A1*
(b) A, B & D circled	B2	Award B1 for any 2 correct nets circled and C not circled
	7	
3. (a) Mean, total of numbers = 154	M1	Attempt to add all given values
÷ 7	m1	FT 'their 154'
= 22	A1	CAO
Put in order 17, 19, 19, 20, 24, 25, 30	M1	
Median = 20	A1	
Mode = 19	B1	
Range = 13	B1	
(b)17 + 19 OR 30 - 19	M1	FT 'their 19'. Accept embedded answers.
36 OR 11	A1	
	9	

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Applications Unit 1 Foundation Tier June 2014	Mark	Comment
4. (a) (cost of room) (5 × 24 =) (£)120 (total cost of meals) 27 × 154 (£)4158 (total money spent) 120 + 4158 + 356 + 165 (£)4799 (total money collected from tickets) 154 × 35 (£)5390 (Money given to charity) (£)591	B1 M1 A1 M1 A1 M1 A1 B1	FT 'their 120' **and** 'their 4158' but not 24 and 27. FT 'their correct total collected' – 'their total money spent' Unsupported correct answer implies all previous marks. <u>*Alternative method*</u> *(cost of room) (5 × 24 =) (£)120 B1* *(Difference in meal and ticket price) 35 – 27 M1* *= (£)8 A1* *(Total money from this difference) 8 × 154 M1* *= (£)1232 A1* *(total money spent) 120 + 356 + 165 M1* *(£)641 A1* *(Money given to charity) (£)591 B1*
Look for • Spelling • Clarity of text explanation • the use of notation, watch for the use of '=', '£' 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 10	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.
4. (b) 6.5 × 3.5 = 22.75 Metres^2 or m^2 or square metres (c) (i) (£)295 + (£)2.8(0) × 20 (£)351 (ii) C = (£)295 + (£)2.8(0)m	M1 A1 U1 M1 A1 B2 7	Independent mark For the intention of multiplying and then adding Accept C = (£)295 + (£)2.8(0) × m Award B1 for (£)295 + (£)2.8(0) × m OR sight of (£)2.8(0) × m or equivalent

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Applications Unit 1 Foundation Tier June 2014	Mark	Comment
5. (a) Strategy knowing that **all** sides are equal in length 27×7 189 (mm) 18.9 (cm) (b) Sight of 60(˚) 360 – 90 – 90 – 60 120(˚)	S1 M1 A1 B1 B1 M1 A1 7	May see 27 or 2.7 on all sides. Sight of 27×9 (=243) implies S1 Or equivalent FT 'their 189(mm)' *Alternative method for changing to cm 1st* *Award S1 as above* *Sight of 2.7 (cm) B1* *2.7×7 M1* *18.9 (cm) A1*
6. (a) 24 (seconds) (b) (i) 3.6 (miles) (ii) 69 (mins) (iii) Before, steeper graph 	B2 B1 B1 E1 5	Award B1 for other multiples of 24 eg 48 (seconds) **OR** for listing multiples of 8 **AND** multiples of 6. Accept "Before as more vertical" or Before, because he travelled 3.6 miles in 30 mins and afterwards, 2.2 miles in 30 mins"
7. (a) Reason, e.g. outside the bookshop (b) Two boxes if you are 30 (c) Suitable question with at least 3 boxes, no overlaps or gaps and prices from a low value upwards (to maybe £20) considered or a number of boxes given but concentrated at lower prices 	E1 E1 B2 4	Accept reference to people not buying, but checking out ready for downloading, 'showcasing', or that 'older people are more likely these days to buy from shops than younger people' Do not accept reference to groups under 20 and over 40. Or refers to widths groups for younger or older people, or unequal groups. Allow 'overlap(s)'. Ignore incorrect response if correct response is given. Do not accept 'doesn't give options for under 20s or over 40s', or '2 options for 20 year olds' B1 Suitable question with at least 3 boxes, with either consistent overlaps or gaps OR a suitable range of prices is not considered, OR B1 for suitable choice of groups with no gaps or overlaps but without a suitable question being asked *Examples of consistent overlaps or gaps:* *'£0 - £5, £5 - £10, £10 - …'* *'under £5, £6 - £10, £11 - £15, £16 - …'* *'over £5, over £10, over £20'** **however possible B2 if asked to tick only one box*
8. (a) 7cm (± 0.2cm) × 8 (÷ 100) 0.56 (m) (b) Measuring 2 appropriate angles (±2°) to check allied, or appropriate corresponding or alternate angles Conclusion based on the angles measured and accurate knowledge of parallel line angle facts.	M1 A1 B1 E1 4	Award M1 only for answers 56cm or 56m or 56 or similar from ±0.2cm tolerance The size of angles may not actually be recorded, e.g. on diagram equal angles marked *x* and *y*. Accept references to the angles which are equal or sum to 180° *(Angle at D & E appropriately 110°±2° or 70°±2°, Angle at A & B appropriately 108°±2° or 72°±2°)* Do not accept 'travelling in the same direction so won't meet'

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Applications Unit 1 Foundation Tier June 2014	Mark	Comment
9. (a) (Number of necklaces is) 918 ÷ 34 = 27 (necklaces)	M1 A1	 *Note: Sight of 270 (yellow) or 162 (black) implies M1, A1*
(Number of yellow beads is 27×10 =) 270 (Number of black beads is 27×6 =) 162	B1 B1	FT their consistent 'derived 27' × 10 correctly evaluated FT their consistent 'derived 27' × 6 correctly evaluated
(b) Deciding to make two bracelets 8 bags of purple beads 3 bags of green beads	B1 B1 B1	OR sight of needing 48 purple or 18 green Reversed answer: '3 purple bags and 8 green bags' following correct working award B1, SC1. Note intention to match 72s is incorrect working. *If no marks, allow SC2 for 4 bracelets with 16 bags of purple beads and 6 bags of green beads, OR* *SC1 for other possible number of bracelets with the number of whole bags of purple and green correctly evaluated in the correct ratio*
	7	
10. (a) 5(7x + 3) (b) -16a -11b (c) 9d – 6e – d + e = 8d – 5e (d) One correct evaluation, $3 \le x \le 4$ 2 correct evaluations, $3.55 \le x \le 3.75$, one either side of 0 2 correct evaluations, $3.55 \le x \le 3.65$, one either side of 0 OR correct evaluation for x = 3.65 if previous B1 awarded 3.6 *No calculations shown: accept "too high",">", etc.*	B1 B1 B1 B1 B1 B1 M1 A1	 Allow -16a (+) -11b FT until 2nd error x $x^3 - 2x - 40$ 3 -19 3.1 -16.409 3.2 -13.632 3.3 -10.663 3.4 -7.496 3.5 -4.125 **3.55 -2.361125** 3.6 -0.544 **3.65 1.327125** 3.7 3.253 **3.75** 5.234375 3.8 7.272 3.9 11.519 4 16
	8	*Award SC1 for an unsupported answer of 3.6*

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UNIT 1 (HIGHER TIER)

Applications Unit 1 Higher Tier June 2014	Mark	Comment
1(a) Reason, e.g. outside the bookshop	E1	Accept reference to people not buying, but checking out ready for downloading, 'showcasing', or that 'older people are more likely these days to buy from shops than younger people' Do not accept reference to groups under 20 and over 40.
(b) Two boxes if you are 30	E1	Or refers to widths groups for younger or older people, or unequal groups. Allow 'overlap(s)'. Ignore incorrect response if correct response is given. Do not accept 'doesn't give options for under 20s or over 40s', or '2 options for 20 year olds'
(c) Suitable question with at least 3 boxes, no overlaps or gaps and prices from a low value upwards (to maybe £20) considered or a number of boxes given but concentrated at lower prices	B2 4	B1 Suitable question with at least 3 boxes, with either consistent overlaps or gaps OR a suitable range of prices is not considered, OR B1 for suitable choice of groups with no gaps or overlaps but without a suitable question being asked *Examples of consistent overlaps or gaps:* *'£0 - £5, £5 - £10, £10 - …'* *'under £5, £6 - £10, £11 - £15, £16 - …'* *'over £5, over £10, over £20'** **however possible B2 if asked to tick only one box*
2(a)(i) 180 + 73 or 360 - 107 $= 253^{(o)}$ (ii) 360 – 42 $= 318^{(o)}$	M1 A1 M1 A1	*SC1 for answers of 073(°) and 138(°) in (i) and (ii)*
(b) 60° with construction arcs (30° by) bisecting 'their angle', with arcs shown Correct 30° from appropriate construction with line shown at the right hand end of the line	M1 M1 A1 7	Accept anywhere on the line *Allow sight of construction arcs for 60°* Line (road) may not be shown Depends on both M marks
3(a) 7cm (± 0.2cm) × 8 (÷ 100) 0.56 (m)	M1 A1	Award M1 only for answers 56cm or 56m or 56 or similar from ±0.2cm tolerance
(b) Measuring 2 appropriate angles (±2°) to check allied, or appropriate corresponding or alternate angles Conclusion based on the angles measured and accurate knowledge of parallel line angle facts.	B1 E1 4	The size of angles may not actually be recorded, e.g. on diagram equal angles marked *x* and *y*. Accept references to the angles which are equal or sum to 180° *(Angle at D & E appropriately 110°±2° or 70°±2°, Angle at A & B appropriately 108°±2° or 72°±2°)* Do not accept 'travelling in the same direction so won't meet'

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Applications Unit 1 Higher Tier June 2014	Mark	Comment
4(a) (Number of necklaces is) 918 ÷ 34 = 27 (necklaces)	M1 A1	
		Note: Sight of 270 (yellow) or 162 (black) implies M1, A1
(Number of yellow beads is 27×10 =) 270	B1	FT their consistent 'derived 27' × 10 correctly evaluated
(Number of black beads is 27×6 =) 162	B1	FT their consistent 'derived 27' × 6 correctly evaluated
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	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: 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		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) Deciding to make two bracelets 8 bags of purple beads 3 bags of green beads	B1 B1 B1	OR sight of needing 48 purple or 18 green Reversed answer: '3 purple bags and 8 green bags' following correct working award B1, SC1. Note intention to match 72s is incorrect working. *If no marks, allow SC2 for 4 bracelets with 16 bags of purple beads and 6 bags of green beads, OR* *SC1 for other possible number of bracelets with the number of whole bags of purple and green correctly evaluated in the correct ratio*
	9	
5(a) 5(7x + 3)	B1	
(b) -16a -11b	B1	Allow -16a (+) -11b
(c) 9d – 6e – d + e = 8d – 5e	B1 B1	FT until 2nd error
(d) One correct evaluation, $3 \le x \le 4$	B1	x $x^3 - 2x - 40$ 3 -19 3.1 -16.409 3.2 -13.632 3.3 -10.663 3.4 -7.496 3.5 -4.125
2 correct evaluations, $3.55 \le x \le 3.75$, one either side of 0	B1	
2 correct evaluations, $3.55 \le x \le 3.65$, one either side of 0 OR correct evaluation for x = 3.65 if previous B1 awarded	M1	**3.55 -2.361125** 3.6 -0.544 **3.65 1.327125** 3.7 3.253
3.6 *No calculations shown: accept "too high", ">", etc.*	A1	**3.75** 5.234375 3.8 7.272 3.9 11.519 4 16
	8	*Award SC1 for an unsupported answer of 3.6*

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Applications Unit 1 Higher Tier June 2014	Mark	Comment
6(a)(i) Total number of rotten apples considered 9 Total number of apples considered 100 9/100 or equivalent	B1 B1 B1	 Allow 3/20+0/20+1/20+4/20+1/20 leading to 9/100 as poor notation *Allow B2 for an answer of 1.8/20*
(ii) 8×9 or equivalent 72 (rotten apples)	M1 A1	FT their (i) × 8 *M1 only for an answer of 72/..., e.g. 72/800*
(b) 2/24 ISW (=1/12 = 0.08333…)	B2 7	B1 for appropriate sight of '2 apples' considered as a response or answers of 3/24 (= 1/8 = 0.125) or 4/24 (= 1/6 = 0.1666…)
7(a) 240, 300, 345, 440	B3	OR B2 for any two correct entries, OR B1 for a correct method seen, or one correct entry
(b)Plots correct for their data at the mid interval with trend line drawn	B2	B1 for correct plots at mid interval, or consistent translated plots with trend line drawn
(c) Explanation, e.g. 'months not equal number of days', 'months about the same number of days'	E1	Accept 'yes' or 'no' depending on a reasonable explanation Allow 'NO, it makes it easier to plot with equal spaces', or 'NO, it still displays the data correctly' Do not accept 'YES, it gives inaccurate display', without an explanation of why
(d) 'NO', stated or implied with a suitable reason, e.g. 'will go down again as it gets to winter (autumn)', 'only rising as it now includes summer months', 'No in the long term as autumn and winter approach', 'no way of knowing'	E1 7	Accept YES with an appropriate reason, e.g. 'Yes in the short term as August has yet to be included'
8. Straight lines parallel to all verticals and horizontals, with lines of radius distance away from the steps (±2mm)	B2	B1 for straight lines, or series of points (>6), parallel to 2 verticals/horizontals, radius distance away (±2mm), OR straight **lines** parallel to all 6 verticals and horizontals but not radius distance away *Do not accept curves with free hand sketches*
All inner steps, locus turn at 90° vertex	B1	
All outer steps, arcs with wheel radius (±2mm)	B2 5	B1 for arcs with wheel radius (±2mm) at 2 outer steps, OR intention of arcs at all outer steps but not necessarily at wheel radius If B5 penalise extra lines drawn -1
9.(a)(i) (800 – 300)/ 50 = 10	M1 A1	Or equivalent
(ii) Explanation, e.g. 'extra cost per person', '£10 per person', '£100 extra for every 10 people'	E1	Do not accept 'more people the more paid' FT from their gradient if reasonable
(iii) Explanation, e.g. 'fixed charge'	E1	Accept 'conference cost starts at £300', or 'hire cost'
(b) (£)200	B1 5	CAO

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Applications Unit 1 Higher Tier June 2014	Mark	Comment
10(a) 44, 76, 80	B1	
(b) Correct cumulative frequency diagram, points plotted at upper bounds and joined by a curve or straight line	B2	Accuracy: nearer the intersection of correct lines than any others FT only if cumulative in (a) B1 for points correct but not joined, OR B1 correct apart from 0.5 translation, OR B1 if one error in plotting but joined correctly
(c)		FT from their **cumulative** entries. Not cumulative means no FT. Accuracy of readings ±0.5
Median ≈ 58 reading from graph	B1	
Low quartile ≈ 55.5 reading from graph	B1	
Upper quartile ≈ 61 reading from graph	B1	
Interquartile range ≈ 5.5	B1	FT their UQ – their LQ correctly evaluated. Independent FT
(d) Range ends correctly indicated (50(cm) and 68(cm))	B1	In (d) FT consistent previous misread of scale Whiskers should be shown
Median line correctly indicated (approx. 58)	B1	If incorrect then FT their median
UQ and LQ correctly indicated (approx. 61 & 55.5)	B1 10	If incorrect then FT their UQ and LQ readings
11(a) Sight of $8(10+x) - x^2$ or $8\times10 + x(8-x)$	M1	OR sight of appropriate areas, e.g 8×10, $8\times x$ and $x\times x$
Convincing $80 + 8x - x^2$	A1	Must follow from correct working
(b) Finding at least two correct values for the area, either in working or plotted	M1	In (b) ignore any points x>5 x: 0, 1, 2, 3, 4, 5 Area: 80, 87, 92, 95, 96, 95
At least 4 correct plots	P1	
All 6 points plotted accurately and joined with a curve	C1	
(c) Either appropriate use of the graph or sight of $83.75 = 80 + 8x - x^2$	M1	
$x = 0.5$	A1	FT from their graph. Allow inclusion of 7.5 with the answer 0.5.
	7	*An answer of 7.5 only implies M1, A0*
12.		
$(8^{⅓} + 4^{-½})$ = 2.5	B1	Allow 2.50
$2.3\times10^{-1} + 9^0$ = 1.2	B1	B0 for 0.23 + 1 = 1.23, or 1.20
$\sqrt[3]{125^2 + 12\times160000^{-¼}}$ = 26	B1	B0 for 25 + 0.6 = 25.6, or 26.0 However if final 2 B marks are not awarded then SC1 for answers 1.23 **and** 25.6 respectively, or 1.20 **and 26.0**
	3	
13(a) Method of finding 1 correct area	M1	
2 correct areas AND intention to add all areas	M1	Areas are $4\times25 + 6\times25 + 7\times25 + 2\times50$ $= 100 + 150 + 175 + 100$
525	A1	CAO. Answer of 600 by considering full area, is award M1, SC1
(b) $1\times75 + 4\times25$ (=175)	M1	
$\times 200$	m1	
(£) 3.5×10^4	A2	A1 for 35000 If no marks, then SC1 for 'their 175'×200 correctly evaluated and expressed in standard form
(c) No, stated or implied with a reason, e.g. 'skew to offices greater than $80m^2$', 'the median (300^{th} value) lies within the 100–125 interval', 'No, the majority are greater than $80m^2$ (or $100m^2$)'	E2	E1 for an answer that implies no with a statement implying that the median is greater than $80m^2$ but without giving a reason why, OR E1 for NO with an incorrect median stated in the range 100<median<125 without further statement
	9	*Do not accept reference to mode*

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Applications Unit 1 Higher Tier June 2014	Mark	Comment
14(a) Approximate period: 24 to 29 (minutes) (b) Tangent drawn at t = 35 Method, difference y / difference x Evaluated answer from their reasonable tangent cm/min (c) $562 = \pi \times r^2$ $r = \sqrt{(562/\pi)}$ (r = 13.37…) C = 2 × π × their r 80 (cm)	B1 B1 M1 A1 U1 M1 m1 M1 A2 10	Accept 25 to 30 (minutes) or 23 to 28 (minutes) Not necessarily from a tangent *(May be approximately 0.2)* Accept 'cm per min(ute)' FT their derived r A1 for 84.0…
15.(a) Finding the y values: (0,) 8, 7(, 0) Use of trapezium rule or splitting into the 3 areas required and attempt to sum Complete correct calculation for the area required 30 (m) (b) 'Under estimate' with reason suggesting that trapezium is beneath the curve	B1 M1 A1 A1 E1 5	May be shown on their graph FT their values for y (8 + 15 + 7) CAO Treat splitting area into 6 parts as MR-1, then follow the stages of the mark scheme

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. WEDNESDAY, 15 January 2014

1 hour 30 minutes

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 **5***(a)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**10**	
3.	**5**	
4.	**9**	
5.	**11**	
6.	**3**	
7.	**9**	
8.	**5**	
9.	**5**	
10.	**2**	
11.	**6**	
12.	**10**	
Total	**80**	

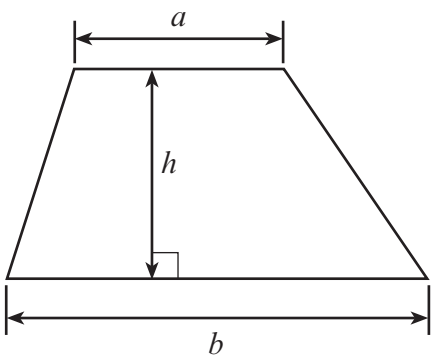
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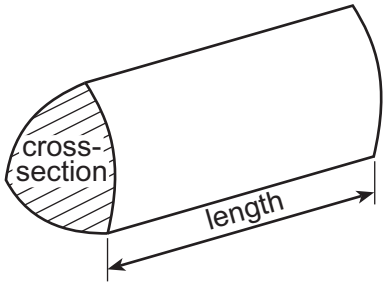
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Formula List

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



Volume of prism = area of cross-section × length



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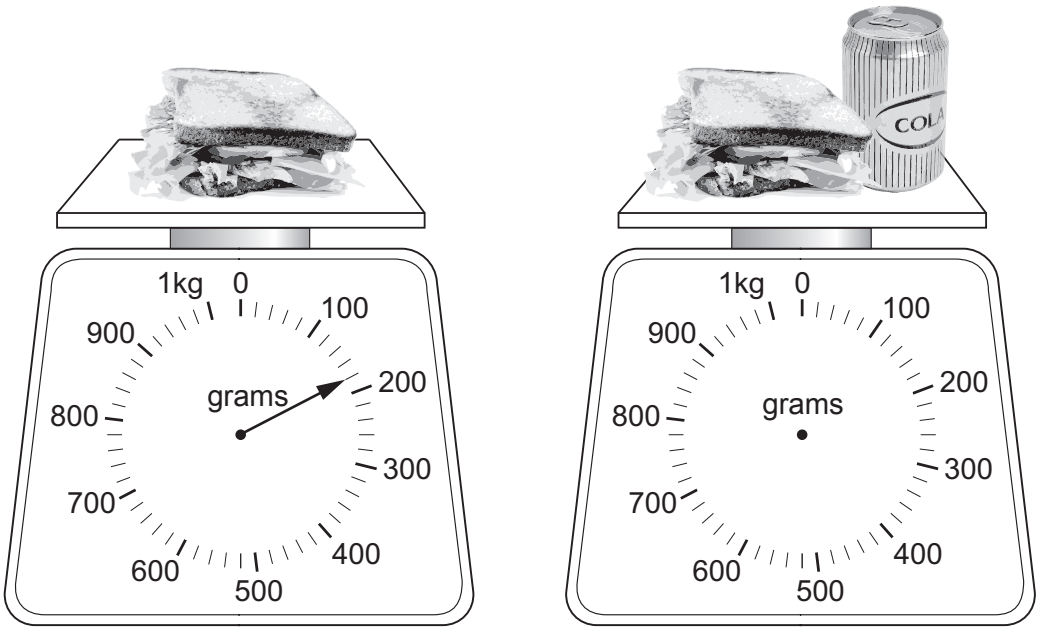
Examiner only

1. *(a)* Rhys decides to weigh his packed lunch.

The pointer on the first scale shows the weight of his sandwich.
His drink weighs 350 grams.
Draw a pointer on the second scale to show the total weight of his sandwich and his drink. [3]

.....

.....



(b) The top of Rhys' drink is in the shape of a circle with diameter 6·2 cm.
Draw a circle with diameter 6·2 cm to represent the top of his drink. [2]

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Examiner only

2. Simon has a photograph of his dog.
The photograph has a length of 6 inches and a width of 4 inches.



Diagram not drawn to scale

(a) Using 1 inch is approximately 2·5 cm, write the measurements of Simon's photograph in cm. [2]

.....

.....

.....

6 inches = ... cm 4 inches = ... cm

(b) Find the area of Simon's photograph. Give your answer in cm^2. [2]

.....

.....

.....

Area = ... cm^2

(c) Simon wishes to have his photograph framed.
The cost, in £, of framing his photograph is calculated using the following formula.

$$C = (L + W) \times 0.55$$

Where C = cost in £
L = length of photograph in cm
W = width of photograph in cm

Find the cost of framing Simon's photograph. [2]

.....

.....

.....

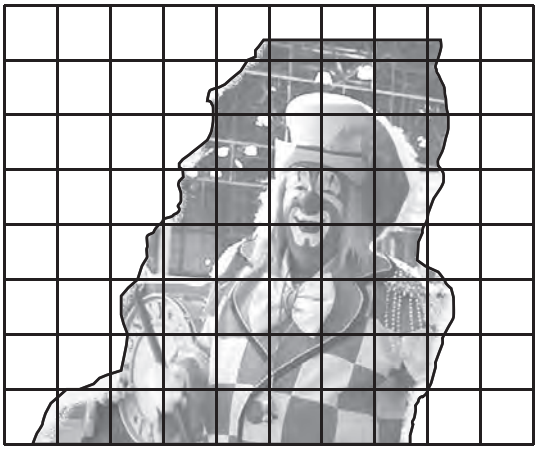
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(d) Simon found part of an old photograph.
Each square represents 3 cm^2.
Estimate the area of the photograph. [4]



.....

.....

.....

Area = ... cm^2

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Turn over.

Examiner only

3. Shari was asked to buy the following items from her local shop.

Item	Price
Chicken curry	£2.97
Pizza	£3.04
Washing powder	£6.09
Butter	£1.13
Bread	89 pence

The shopkeeper tells Shari that the total is £102.23.

Shari does not think that this is correct.

Show clearly how Shari could **approximate each of these prices** to convince the shopkeeper that **his total** is not correct. [4]

.....

.....

.....

.....

.....

.....

What mistake do you think the shopkeeper made? [1]

.....

.....

.....

.....

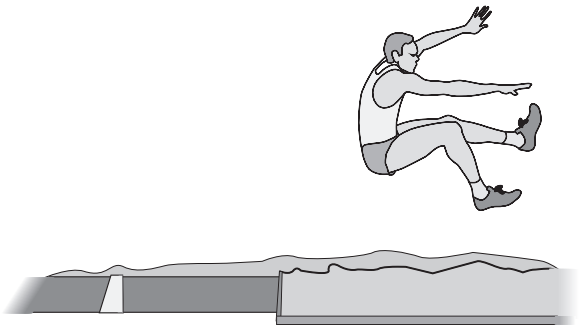
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4.



In an athletic competition, Billy jumped the following distances in the long jump.

4·10 m	4·08 m	4·36 m	4·25 m	4·36 m	4·17 m	4·41 m	4·27 m

(a) What were Billy's longest and shortest jumps in the athletic competition? [2]

Longest jump = ... m Shortest jump = ... m

(b) Calculate the mean, median, mode and range of the 8 distances given in the table. [7]

Mean

.....

.....

.....

.....

Median

.....

.....

.....

Mode

.....

Range

.....

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4361 010007

5. A group of family and friends decide to go away for the weekend together.

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

The group of family and friends book tickets for the theatre for the first evening of their weekend.

The group consists of 6 adults, 4 children and 2 senior citizens.

The following information shows the cost of the tickets for seats in different parts of the theatre.

Seated Area	Cost per person	
Lower Stalls	£45	
Mid Stalls	£45 - £60	**Rows A - C** £45 **Rows D - J** £60
Circle	£35 - £45	**Rows A - C** £45 **Rows D - G** £35
Upper Circle	£25 - £30	**Rows A - F** £30 **Rows G - K** £25
Boxes	£45	
Balconies	£15 - £25	**Balconies A - D** £25 **Balconies E - H** £15

The family and friends were unable to book tickets to sit together.

They book the following seats:

- 2 adults and 1 child in the Upper Circle - Row C
- 2 senior citizens in the Mid Stalls - Row F
- 4 adults and 3 children in Balcony A.

The tickets for senior citizens and children are half price.

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Find the total cost of the tickets for the group of family and friends.

You must show all your working. [7]

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(b) On the second day, the group of family and friends go to an agricultural show.
The diagram shows four halls at the showground.

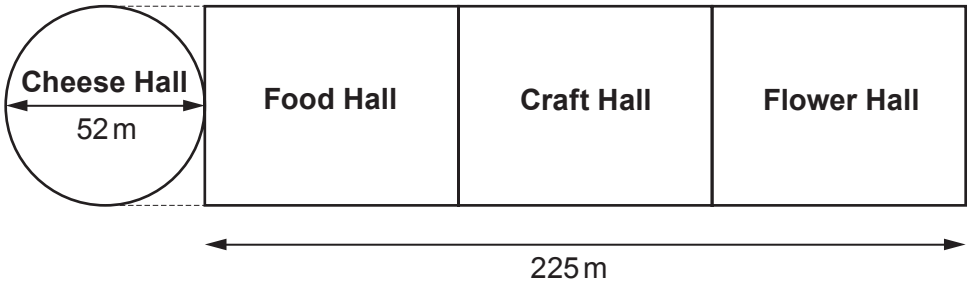


Diagram not drawn to scale

The diameter of the circular hall is 52 m.
The total length of the 3 rectangular halls is 225 m.
The rectangular halls are all the same size.

Calculate the area of the Flower Hall. [4]

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6. The graphs below were sketched to represent three of the following four statements:

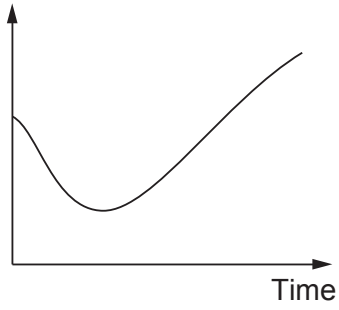
A. An oven warming up until it reaches the required temperature to bake a cake

B. The temperature of a cup of coffee as it cools

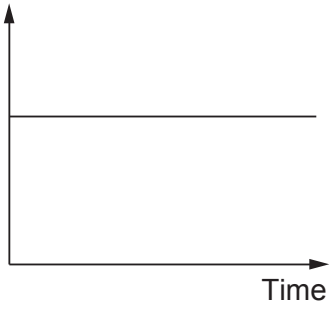
C. Ceri's body temperature remained constant throughout the day

D. The temperature dropped overnight and rose the next morning

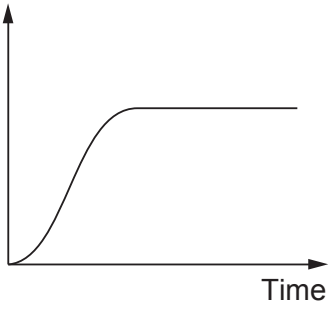
Match a statement to each of the following graphs. [3]



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7. Jamie is making party tags in the shape of a trapezium, as shown below.

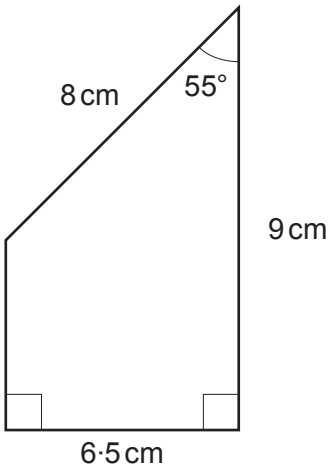


Diagram not drawn to scale

(a) Jamie thinks the missing angle inside the trapezium is an obtuse angle.
Explain fully why Jamie is correct. [3]

.....

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.....

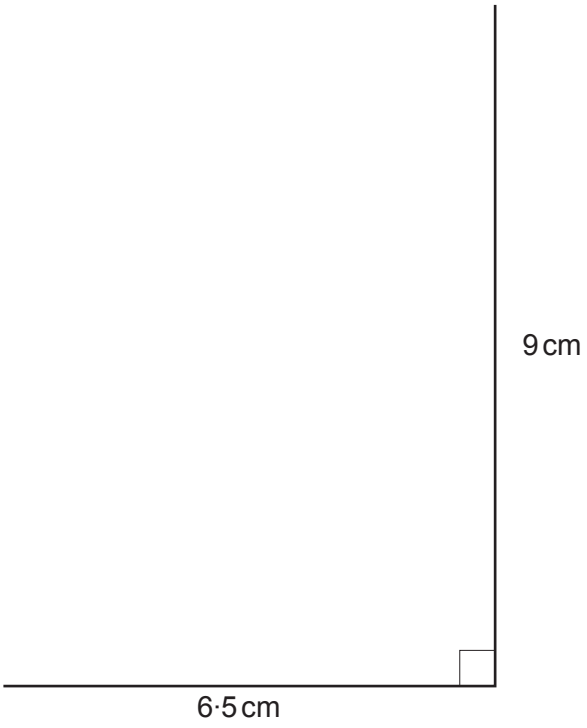
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(b) Part of the party tag has been drawn accurately below.
Accurately complete the rest of the party tag. [3]



(c) Jamie wants to place a gold border around the outside of her party tags.
What length of gold border does Jamie need for each party tag? [3]

.....

.....

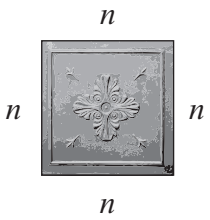
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Examiner only

8. *(a)* A square tile has edges of length n centimetres.



(i) Write an expression for the perimeter of the square tile. [1]

.....

.....

(ii) Three of the square tiles are put together to make the following **shape**.



Write an expression for the perimeter of this shape. Simplify your expression fully. [2]

.....

.....

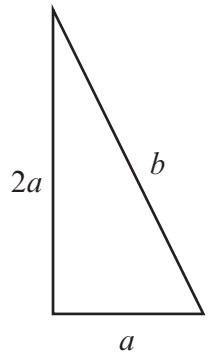
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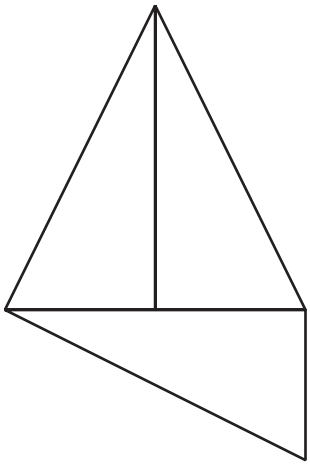
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Examiner only

(b) A right-angled triangular piece of plastic has edges of length a, b and $2a$ centimetres, as shown in the diagram.



Three of these right-angled triangular pieces of plastic are put together to create another shape, as shown below.



Write an expression for the perimeter of this shape.
Simplify your expression fully. [2]

.....

.....

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Turn over.

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Examiner only

9. A survey is carried out by asking people questions as they come out of a juice bar.



A section of the questionnaire is shown below.

In questions 1 and 2 put a tick (✓) in a box

1. How old are you?

   15 to 20 ☐ 21 to 30 ☐ 30 to 40 ☐ 41+ ☐

2. Do you ever go to the juice bar to buy a fruit drink?

   Yes ☐ No ☐

3. What method of payment do you use? .....

(a) Explain why this is a biased survey. [1]

.....

.....

(b) State two criticisms of the design of question 1.
First criticism of question 1: [1]

.....

.....

Second criticism of question 1: [1]

.....

.....

(c) (i) What is wrong with the design of question 3? [1]

.....

.....

(ii) Show how question 3 could be improved. [1]

.....

.....

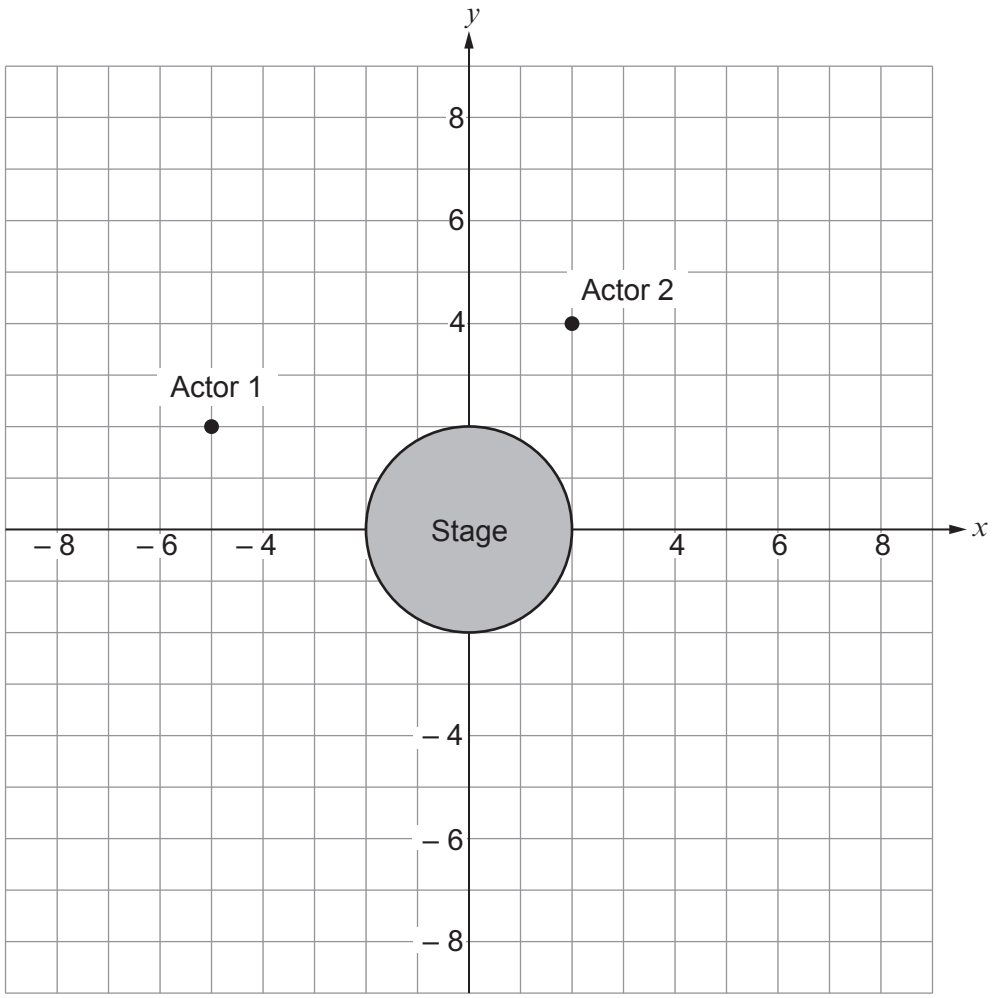
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10. The circular stage in *Theatr Seren* is in the centre of the theatre.
It is decided to seat four actors amongst the audience to hold the ends of four ribbons.
A plan of the theatre is represented by the coordinate grid shown below.
The actors are to be seated so that ribbons held by the four of them will form a square.



Mark where the other two actors should be seated, and write down the coordinates of their positions. [2]

(..... , ...) (..... , ...)

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11. *MacReardon Construction* is contracted to work on a warehouse site where there are a number of liquid storage tanks.



A sketch of the base of one of the liquid storage tanks is shown below.

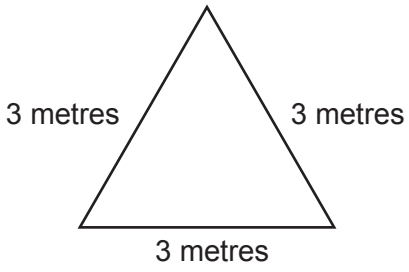


Diagram not drawn to scale

(a) Use a pair of compasses and a ruler to make an accurate scale drawing of the base shown above.
Use a scale of **2 cm to represent 1 metre**. [3]

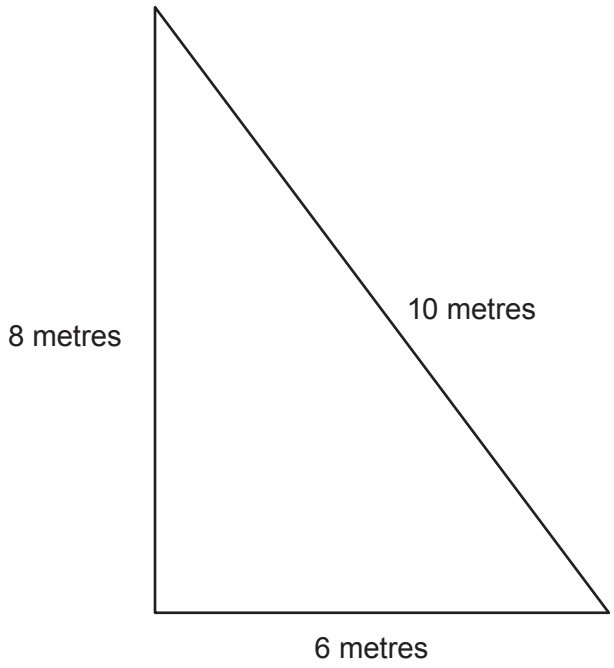
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(b) *MacReardon Construction* has been asked to lay a drain surrounding a different liquid storage tank. The drain must be exactly **2 metres** away from the perimeter of the base of the tank.

An accurate scale drawing of the base of this tank is shown below.
A scale of **1 cm to represent 1 metre** has been used.
On the scale drawing below, draw accurately the position of the drain surrounding the tank. [3]



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12. A machine is used to pack boxes of pasta shapes.

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Each box of pasta shapes should weigh between 200 g and 205 g.
To check the machine, 10 boxes of pasta shapes are selected every half hour.
At each of these times, the number of boxes weighing between 200 g and 205 g is recorded.
The results are shown in the table below.

Time	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	04:30
Number of the 10 boxes weighing between 200 g and 205 g	1	0	2	1	3	2	0	0	1	2

(a) Michelle has weighed all the boxes of pasta selected between 00:00 and 04:30.
For all these boxes, she finds that the following statement is true.

"Each box of pasta weighs at least 200g."

Explain, looking at the results in the table above, how this statement could be **true**. [1]

.....

.....

.....

(b) Michelle decides to record and plot the relative frequencies for the information shown in the previous table.

(i) Complete the table below. [4]

Time, up to	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	04:30
Total number of the 10 boxes weighing between 200 g and 205 g	1	1	3	4						
Total number of boxes checked	10	20	30	40						
Relative frequency	0·1	0·05								

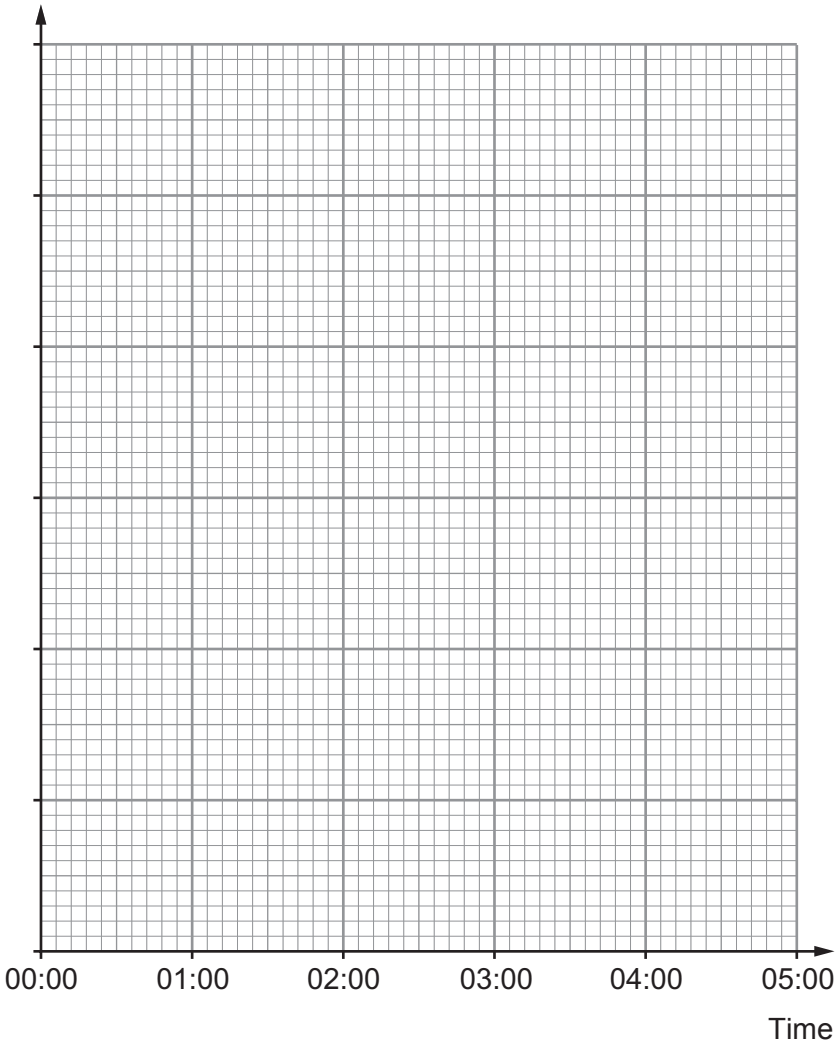
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(ii) Use the graph paper below to plot the relative frequencies. [3]

Relative frequency



(iii) Write down the best estimate for the probability that a box selected at random will weigh between 200 g and 205 g. Give a reason for your answer. [2]

.....

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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 1 Higher Tier	5
Unit 2 Foundation Tier	10
Unit 2 Higher Tier	14

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APPLLICATIONS UNIT 1
FOUNDATION TIER

<table>
<tr><th>Applications Unit 1 Foundation Tier January 2014</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. (a) Arrow drawn or indicated to 530 (grams)

(b) Circle drawn with radius 3.1cm</td><td>B3

B2

5</td><td>Accept indication between 520 and 540 exclusive
Award B2 for sight of 350 + 180 (=530)
OR correct evaluation indicated on diagram of 350 + “their 180”
Award B1 for sight of 180
OR for 350 + “their 180”
e.g. 350 + 190 (=540) or 350 + 140 (=490)
±2mm. Award B1 for circle with radius 6.2cm or attempt of drawing circle with radius 3.1cm</td></tr>
<tr><td>2. (a) 6 inches = 15 cm
4 inches = 10 cm

(b) 15 × 10
= 150 (cm^2)
(c) (15 + 10) × 0.55

= (£)13.75
(d) Attempt to count area
Estimate area within range 34 - 40
‘Their area’ × 3
Answer</td><td>B1
B1

M1
A1
M1

A1
M1
A1
M1
A1
10</td><td>

If 6 and 4 used in (b) and/or (c) penalise -1 once only
FT from (a) including use of 6 and 4 (inches).

M1 for substitution of values. FT from (a) including use of 6 and 4 (inches). For substitution, accept 25 × 0.55

FT “their area”
Note: for 34 – 40 area is 102 - 120</td></tr>
<tr><td>3. Rounded values
<table><tr><th>Item</th><th>Cost</th></tr><tr><td>Chicken curry</td><td>£3</td></tr><tr><td>Pizza</td><td>£3</td></tr><tr><td>Washing Powder</td><td>£6 or £6.10</td></tr><tr><td>Butter</td><td>£1 or £1.10</td></tr><tr><td>Bread</td><td>£1 or 90p</td></tr></table>
Approximate total = £14 or £13.90 or £14.10 or £14.20

Suitable explanation e.g. “ shopkeeper added £89 not 89 pence”</td><td>B3

B1

E1

5</td><td>Award B3 for all 5 values rounded
Award B2 for 3 or 4 values rounded
Award B1 for 1 or 2 values rounded

FT their approximated values if at least B2 awarded. If added up prices to give £14.12 and gives approximate value to be £14 award final B1

Accept “he forgot the decimal point for the 89 pence”</td></tr>
<tr><td>4. (a) longest jump = 4.41 (m)
Shortest jump = 4.08 (m)

(b) Adding numbers (= 34)
34 ÷ 8
Mean = 4.25(m)
In order 4.08, 4.10, 4.17, <u>4.25, 4.27</u>, 4.36, 4.36, 4.41
Median = 4.26(m)
Mode = 4.36(m)
Range = 0.33(m) or 33(cm)</td><td>B1
B1

M1
m1
A1
M1
A1
B1
B1
9</td><td>Award B1 for correct answers in incorrect place.

Attempt to add numbers
FT ‘their 34’
CAO
Accept sight of only 4.25 and 4.27

FT their values in part (a)</td></tr>
</table>

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Applications Unit 1 Foundation Tier January 2014	Mark	Comment
5. (a) (2 adults & 1 child Upper Circle row C) Sight of 30 and 30 and 15 (= 2 × (£)30 + (£)15 = 75) (2 senior citizens Mid Stalls row F) Sight of 30 and 30 (= 2 × (£)30 = 60) (4 adults & 3 children Balcony A) Sight of 4 lots of 25 and 3 lots of 12.5(0) (= 4 × (£)25 + 3 × (£)12.5(0) = 137.50) Intention of adding their appropriate costs Total cost of tickets = (£)272.5(0)	B1 B1 B1 M1 A1	CAO
<u>Notes:</u> QWC2 can only be awarded if the correct unit is shown in the final answer and the zero is included in the final answer. QWC2 requires words (labels) throughout the response not just connected to the final answer. Look for • spelling • clarity of text explanations, labels • the use of notation (watch for the use of '=', '£' and '0' appropriately used) 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) length of each rectangular hall = 225 ÷ 3 = 75 Area of Flower Hall = 75 × 52 = 3900 (m^2) Mark final answer	M1 A1 M1 A1 11	*Alternative Method* *Total area of rectangular halls = 225 × 52* *= 11700* *Area of flower hall = 11700 ÷ 3* *= 3900 (m^2)*
6. D C A	B1 B1 B1 3	

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Applications Unit 1 Foundation Tier January 2014	Mark	Comment
7. (a) 360 – (90 + 90 + 55) = 125(˚) 125(˚) is more than 90(˚) but less than 180(˚) which is an obtuse angle (b) angle of 55˚ drawn Line of 8cm drawn Shape completed (c) Missing length of shape measured (approx 4.3cm) Length of gold border = 6.5 + 9 + 8 + (4.3) = (27.8) (cm)	M1 A1 E1 B1 B1 B1 B1 M1 A1 9	 Accept "looks more than 90(˚) but less than 180(˚). Must be a full explanation. ±2˚ ±2mm Award this B1 provided at least B1 awarded previously. ±2mm. FT their quadrilateral provided not a rectangle. FT their 4.3. Accept measurements ±2mm for 8cm
8.(a)(i) $4n$ (ii) $8n$ (b) $a + 3b$	B1 B2 B2 5	Accept $n \times 4$ or $n4$ or $n + n + n + n$ Award B1 for a correct expression not fully simplified Award B1 for a correct expression not fully simplified OR B1 for either term correct written as an expression OR both terms correct but not written as an expression.
9.(a) Reason, e.g. 'outside the juice bar', 'mostly younger people use juice bars' (b) Any 2 of: 'No under 15s', '30 appears in two boxes', 'may object to giving their age' (c) (i) Explanation, e.g. 'vague', 'no options', 'open question', 'can't display answers easily', 'can't answer if answer to Q2 is NO', 'many payment methods', 'not same pattern as Q1 & Q2', 'no boxes to tick' (ii) States 'need to give options', 'change question to allow for no drink bought' OR give some options, e.g. card, cash, vouchers from phone, etc	E1 E2 E1 B1 5	Accept reference to question 2. Accept reference to age bias E1 for each response. Do not accept: Over 40s in one group, gaps between ages different *Mark responses in the sections they appear, do not pick out responses in other sections.* *In all parts ignore additional information given by the candidate once a correct response has been given credit.*
10. (4, -3) (-3, -5)	B2 2	B1 for either or for marking both correct points on the grid. SC1 for (-2.5, 6.5) or (-7, 9)
11.(a) At least 2 sides of a triangle 6 cm (±2mm) Construction arcs to make at least 1 60° (±2°) angle Accurate triangle (see overlay) (b) Lines parallel to each side a distance of 2cm (±2mm) away Arc 2cm (±2mm) centred on at least one vertex Correct drain placement (as overlay)	 M1 M1 A1 M1 M1 A1 6	*Penalise -1 for incorrect scale in (a), then FT* Depends on M2 *Penalise -1 for incorrect scale in (b), then FT*

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Applications Unit 1 Foundation Tier January 2014	Mark	Comment
12.(a) Explanation, e.g. 'no box had less than 200g', or 'no underweight boxes of pasta', '**all other** boxes must weigh more (than 205g)', or similar	E1	Do not accept '**some** of the **other** boxes weigh more', or 'all boxes weigh more'. Do not accept a repeat of the question
(b)(i)		
(3) (4) 7 9 9 9 10 12 (30) (40) 50 60 70 80 90 100 0.1 0.1 0.14 0.15 0.128.. 0.1125 0.111.. 0.12	B1 B1 B2	FT from their cumulative totals to last row Accept truncation to 2d.p. Accept percentages B1 for any 6 correct, or all truncated to 1d.p.
(ii) Uniform scale on vertical axis	B1	
Correct plots (allow joined or not joined)	B2	FT from (b)(i) only for r.f.<1, %<100% Need not start at 0. FT to plots if possible B1 for at least 6 correct plots
(iii) (0.12)	B1	No FT to (iii) for either mark for r.f.>1 Correct response or strict FT from their last relative frequency, but must be ≤ 1
Explanation: e.g. "last point plotted", "all data used"	E1	Do not accept references to most common, all round to 0.12, etc
	10	

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APPLICATIONS UNIT 1
HIGHER TIER

Applications Unit 1 Higher Tier January 2014	Mark	Comment
1.(a) Reason, e.g. 'outside the juice bar', 'mostly younger people use juice bars'	E1	Accept reference to question 2. Accept reference to age bias
(b) Any 2 of: 'No under 15s', '30 appears in two boxes', 'may object to giving their age'	E2	E1 for each response. Do not accept: Over 40s in one group, gaps between ages different
(c) (i) Explanation, e.g. 'vague', 'no options', 'open question', 'can't display answers easily', 'can't answer if answer to Q2 is NO', 'many payment methods', 'not same pattern as Q1 & Q2', 'no boxes to tick'	E1	*Mark responses in the sections they appear, do not pick out responses in other sections. In all parts ignore additional information given by the candidate once a correct response has been given credit.*
(ii) States 'need to give options', 'change question to allow for no drink bought' OR give some options, e.g. card, cash, vouchers from phone, etc	B1 5	
2.(a) At least 2 sides of a triangle 6 cm (±2mm) Construction arcs to make at least 1 60° (±2°) angle Accurate triangle (see overlay) (b) Lines parallel to each side a distance of 2cm (±2mm) away Arc 2cm (±2mm) centred on at least one vertex Correct drain placement (as overlay)	 M1 M1 A1 M1 M1 A1 6	*Penalise -1 for incorrect scale in (a), then FT* Depends on M2 *Penalise -1 for incorrect scale in (b), then FT*
3.(a) Explanation, e.g. 'no box had less than 200g', or 'no underweight boxes of pasta', '**all other** boxes must weigh more (than 205g)', or similar (b)(i)	E1	Do not accept '**some** of the **other** boxes weigh more', or 'all boxes weigh more'. Do not accept a repeat of the question
(3) (4) 7 9 9 9 10 12 (30) (40) 50 60 70 80 90 100 0.1 0.1 0.14 0.15 0.128.. 0.1125 0.111.. 0.12	B1 B1 B2	FT from their cumulative totals to last row Accept truncation to 2d.p. Accept percentages B1 for any 6 correct, or all rounded or truncated to 1d.p.
(ii) Uniform scale on vertical axis Correct plots (allow joined or not joined)	B1 B2	FT from (b)(i) only for r.f.<1, %<100% Need not start at 0. FT to plots if possible B1 for at least 6 correct plots
(iii) (0.12)	B1	No FT to (iii) for either mark for r.f.>1 Correct response or strict FT from their last relative frequency, but must be ≤ 1
Explanation: e.g. "last point plotted", "all data used"	E1 10	Do not accept references to most common, all round to 0.12, etc
4. (4, -3) (-3, -5)	B2 2	B1 for either or for marking both correct points on the grid. SC1 for (-2.5, 6.5) or (-7, 9)

(3)	(4)	7	9	9	9	10	12
(30)	(40)	50	60	70	80	90	100
0.1	0.1	0.14	0.15	0.128..	0.1125	0.111..	0.12

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Applications Unit 1 Higher Tier January 2014	Mark	Comment
5.(a)(i) [18 + 12 × 2 + 30 × 0.25] ×1.2 (=49.5(0)×1.2)	M1	Intention ×1.2 however brackets may be missing
(£)59.4(0)	A1	
(ii)(£)35.1(0)	B1	
(b) Sight of 12 × h OR (0).25 × m, m/4	B1	Or equivalent in pence throughout
18 + 12 × h + (0).25 × m OR the product of 1.2 by the sum of at least 2 correct terms	B1	
F = 1.2(18 + 12 h + 0.25m) or equivalent	B2	Accept F= (18 + 12 × h + (0).25 × m) × 1.2 B1 for (F =) 18 + 12 × h + (0).25 × m ×1.2, i.e. missing brackets or partially in brackets OR (18 + 12 × h + (0).25 × m) × 1.2 with any 2 of the 3 terms within the brackets correct *Ignore if F is written as T*
(c) Explanation, e.g. '60×25p is more than the cost per hour', or '£15 paying for an hour charged by the minute, but £12 for the hour', '50×25p (=£12.50) is more than the cost per hour', or 'between 48 and 60 minutes cost more than an hour', or similar	E1	
	8	
6.(Area 1 slab =) 30×40 + ½×30×40 (cm^2) (=1800cm^2)	M1	OR ½ × 40× (60 + 30) (cm^2)
(Area 25 slabs =1800) × 25 (=45000cm^2)	m1	OR 25×0.18, intention their area× 25
(45000÷10000 =) 4.5 (m^2)	B1	Conversion to m^2 or correct use of measures in m with area calculation. 'Their 45000'÷10000 correctly evaluated. This may be done early as each length ÷100, or area single slab ÷10000
(Number of tins of sealant =) 6	B1	FT 'their area'/0.8 evaluated and rounded up Allow for 'their area' of 1 slab, mark is for the intention to divide by 0.8 and round up the answer. Only award for calculations involving rounding up
(Paving slabs) 25 × £8.25 (£206.25) + (+) (6 tins of sealant) 6 × £14.49 (£86.94)	M1	Their full calculation, FT their **whole** number of tins of sealant. Must be whole number of tins
((Total cost = £)293.19	A1	CAO
Look for • use of units, e.g. £, cm^2, m^2 • notation, e.g. '=' • labels for calculations 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 8	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 1 Higher Tier January 2014	Mark	Comment
7. Any common multiple of any 2 of 40, 24 and 16 OR 40 = 2 × 2 × 2 × 5 OR 24 = 2 × 2 × 2 × 3 Working towards a common multiple of 40, 24 and 16, looking at multiples, allowing 1 error in 1 sequence of multiples OR 40 = 2 × 2 × 2 × 5 and 24 = 2 × 2 × 2 × 3 and 16 = 2 × 2 × 2 × 2 2 × 2 × 2 × 2 × 3 × 5 (= 240) or any multiple of 240 Table completed correctly, or sight of correct number of boxes in working, e.g. Springs 6 boxes Washers 10 boxes Rods 15 boxes Or answers 6n, 10n, 15n when n is an integer and n>0	M1 M1 A1 A1 4	Numbers do not need to be prime, accept e.g. 40 = 8×5 OR 24 = 8×3 Accept 40 = 8×5 and 24 = 8×3 and 16 = 8×2
8.(a) Journey 800 km seen or implied Length on map measured, answers in the range 9cm to 10.5cm inclusive 800 ÷ … Sentence completed or implied by correct evaluation (b) Both bearings correct 273°±2° and 030°±2° (c) 2.5×10^{-1} (d) (T =) d/s + b or (T=) $\frac{d + bs}{s}$ or equivalent	B1 B1 M1 A1 B2 B2 B2 10	FT 800 ÷ 'their measurement in cm' B1 for either bearing correct ±2°, or both correct ±3°, or for 270±3° with 30±2° B1 for 0.25(km), or for 'their answer' in km correctly expressed in standard form, provided 'their answer'<1 or 'their answer' >10 SC1 for 2.5×10^4 (25000 in standard form) B1 for (T=) t + b with sight of d/s elsewhere

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Applications Unit 1 Higher Tier January 2014	Mark	Comment
9.(a)(i) Mid points 2.5, 5.5, 8.5, 11.5 2.5×32 + 5.5×26 + 8.5×14+ 11.5×2 (=365) ÷ 74 (£)4.93(2…) (ii) (£)11.99 (b)(i) 60, 61, 63, 69 (ii) Correct plots at mid interval points Solid trend line shown (iii) Any 2 suitable comments about number of visitors (not the lines) one comment on time series and one comment on the trend line	B1 M1 m1 A1 B1 B3 P2 L1 E1 E1 13	 FT their mid-points (within & including bounds) Their Σfx ÷ 74. Accept reasonable rounding from correct working Allow (£)12 B2 for any two correct entries, B1 for correct method seen, or 1 correct entry FT for their values from (b)(i) P1 for any 2 correct plots or a consistent translation for all correct values to labelled season (bounds) FT from P1. Allow a dotted line FT from (b)(i) and their trend line Do not accept descriptions of the lines Accept 'summer more popular' Do not accept 'steeper' (refers to the line not visitors)
10. $1000^{2/3}$ | $\mathbf{10^2}$ | $\mathbf{1 \times 10^2}$ $\mathbf{1000^4}$ | 10^{12} | $\mathbf{1 \times 10^{12}}$ $1000^{-1/3}$ | $\mathbf{10^{-1}}$ | $\mathbf{1 \times 10^{-1}}$ $\mathbf{1000^{-8}}$ | 10^{-24} | $\mathbf{1 \times 10^{-24}}$	B4 B2 6	B1 for each of 10^2, 1000^4, 10^{-1} and 1000^{-8} in the correct cell For standard form entries, FT from their penultimate column written in standard form, OR B1 for at least one standard form correct or FT
11. Strategy: use of ratio and πr^2 Use of A : B is 2 : 3 or sight of 2/5 Area circle = $\pi \times 1.5^2$ Area A = $(2/5) \times \pi \times 1.5^2$ = 2.8(27.. cm^2)	S1 B1 B1 M1 A1 5	May included use of a three stage ratio, e.g. 2 parts of 7 Mark final answer
12.(a) 5 (athletes) (b) 15 (athletes) (c) 45 – 25 = 20 (seconds) (d) t | 0 to 10 | 10 to 15 | 15 to 20 | 20 to 25 | 25 to 30 | 30 to 40 | 40 to 50 f | 0 | 5 | 0 | 5 | 5 | 5 | 20 f.d. | 0 | 1 | 0 | 1 | 1 | 0.5 | 2 Axes labelled 'frequency density' and 'time' with appropriate scales, with at least 1 correct bar Correct histogram (as acetate)	B1 B1 M1 A1 B1 B1 B1 M1 A1 9	 Indication of groups Allow 20 to 30 taken as one group Correct frequency. FT for their groups, provided there are at least 4 groups Frequency density, FT from a total of 1 or 2 errors in groups and/or frequencies FT from their frequency densities, but not from raw data (frequency) and not cumulative data (cumulative frequency) *If M0, A0, allow SC1 for correct histogram with correct groups, but axes not labelled*

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Applications Unit 1 Higher Tier January 2014	Mark	Comment
13.(a) (10) × 60 × 60	M1	
÷ 1000	M1	
36 (km/h)	A1	
(b) Tangent at t = 30	M1	
Use of difference in v / difference in t	M1	Accept with or without sight of a tangent
Acceleration …… (reasonable for their tangent)	A1	Must be evaluated from their tangent
m/s^2 or ms^{-2}	U1	Independent
(c) Use of area under the curve from 0 to 30 seconds	S1	*Treat area 0 to 50 seconds as MR-1 then FT*
Correct method, including ½×4×30 or ½×5×30	M1	Accept any suitable calculation for 1 or more blocks of area
Correct answer to calculation, e.g. 60(m) to 75(m)	A1	If units are given they must be correct *Trapezium rule (approximate values)* *10×[0+4.4+2(1.75+3.4)]/2 =73.5(m)*
(d) Attempt to find at least one point, i.e. value of v for a value of t between 10 and 50	S1	t: 10, 20, 30, 40, 50 v: 0.4, 1.6, 3.6, 6.4, 10
At least 2 correct plots or 2 appropriate values of v	P1	
Suitable curve between 30 and 40 or 3 values of v evaluated in the interval $30 \leq t \leq 40$	C1	
(t is) 35 or 36 seconds (to the nearest second)	B1	CAO *Allow B4 for a correct answer resulting from a substitution or trial method*
	14	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

A.M. FRIDAY, 14 June 2013

$1\frac{1}{2}$ 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 **1***(b)*.

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

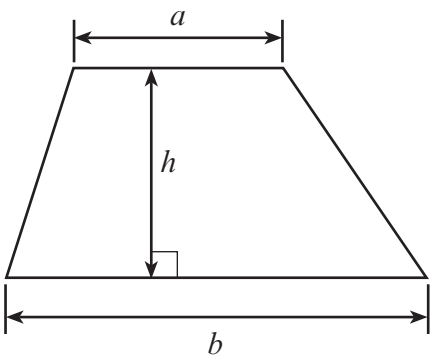
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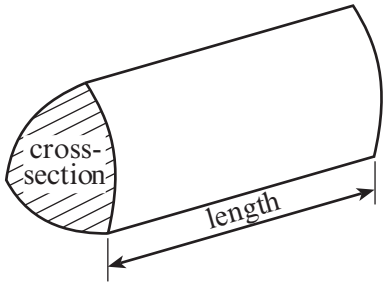
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Formula List

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



Volume of prism = area of cross-section × length



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1. The table below shows the activities that are available at a local leisure centre and the cost of these activities.

Leisure Centre	
Activity	**Cost**
Swim	£3.60
Circuits	£4.40
Gym	£5.20
Aqua-aerobics	£4.60
Zumba fitness	£4.50
Health suite (Sauna etc)	£5.70

(a) Joshua decides that he would like to go to the gym and then go swimming.
How much will this cost him in total?

.....

.....

.....

[2]

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

In a month, Naomi paid to go to Circuits 5 times, Zumba fitness 4 times, Aqua-aerobics 3 times and swimming 6 times.
Naomi could have bought a monthly ticket costing £33.
This monthly ticket would have allowed her to use as many of the activities as often as she wanted.

How much would Naomi have saved if she had bought a monthly ticket?
You must show your working.

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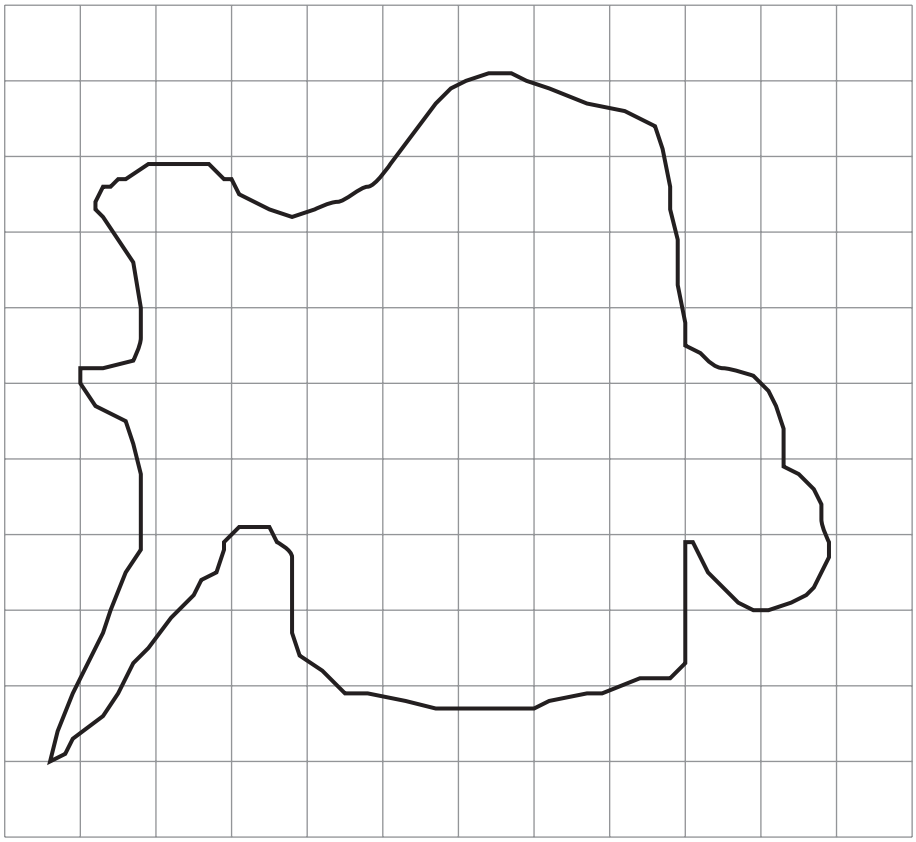
[7]

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2. *(a)* The diagram shows an outline of an island in the Caribbean.
Each square of the grid has an area of 25 km^2.
Use the grid to estimate the area of the island.



.....

.....

.....

.....

Area of island = ... km^2.

[4]

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Turn over.

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(b) Coastguard stations, at *A* and *B*, are 8 km apart, with *B* due East of *A*.
A sailor in trouble at sea sets off a flare at *C*, which is seen by both coastguard stations.
The position of *C* from each coastguard station is shown in the sketch below.

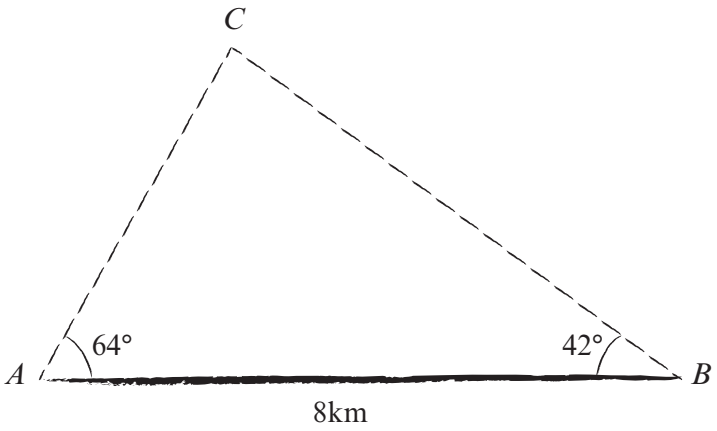


Diagram not drawn to scale

Using a scale of 1 cm to represent 1 km, construct an accurate triangle to show this information and use it to find the distance of *C* from each of the coastguard stations.

Distance of *C* from *A* = ... km

Distance of *C* from *B* = ... km

[5]

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(c) The island has two companies that hire fishing boats to visitors.





Robert wants to hire a boat to go fishing with his friends.
He needs the boat from 9:15 a.m. to 5:30 p.m.
Showing all your working, which company would be cheaper **and** by how much?

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[7]

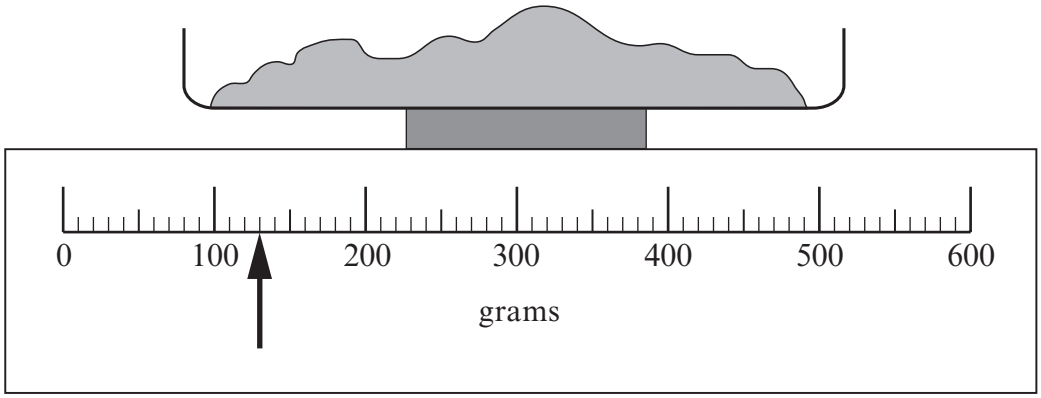
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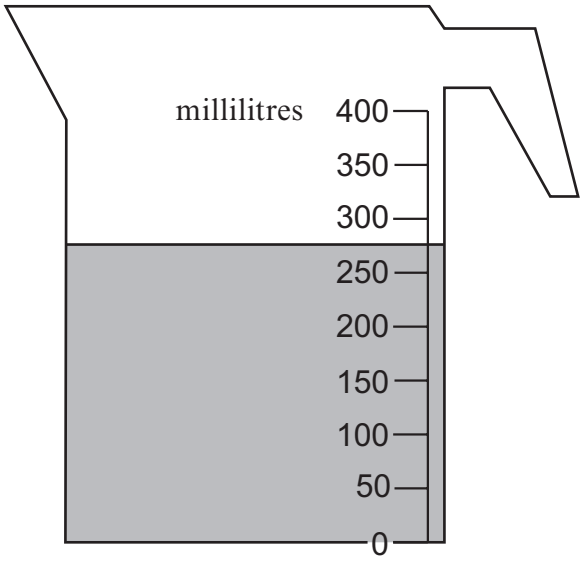
3. Asim used flour, milk and eggs to make pancakes.
He weighed the flour and measured the milk.
His measurements are shown on the diagrams below.



What does the flour weigh?

Weight of flour = ... grams.

[1]



What is the volume of milk?

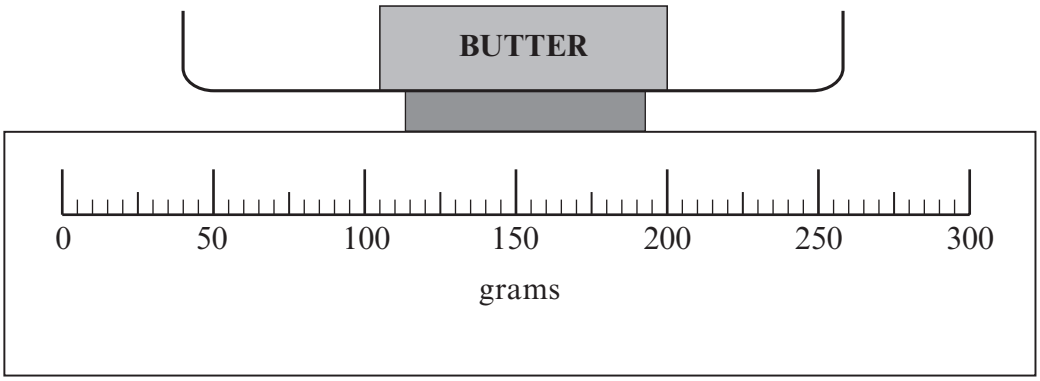
Volume of milk = ... millilitres.

[1]

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Asim also needs 65 grams of butter.
Draw a pointer on the following scale to show the weight of 65 grams of butter.



[1]

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4. There were 8652 people watching a rugby match.

(a) Two thirds of the people were supporting the home side.
How many people were supporting the home side?

.....

.....

.....

.....

[2]

(b) At half-time, 4120 hot-dogs were sold to children and adults in the ratio 5:3 respectively.
How many hot-dogs were sold to children?

.....

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.....

.....

.....

Hot-dogs sold to children .....

[2]

(c) The radio report said

"... there were around 9000 people at the match."

Explain why this was a reasonable comment.

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.....

[1]

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5. *(a)* Complete the probabilities for the events given in the following table.

	Event	Probability
A	Getting a head on a single throw of a fair coin.	
B	Rolling a 4 on a single roll of an ordinary dice.	
C	Choosing Saturday when selecting a day at random from the days of the week.	
D	Choosing a letter *t* when selecting a letter at random from the word *stamp*.	

[2]

(b) Place the above events in increasing order of probability.

Least chance .... Greatest chance

[1]

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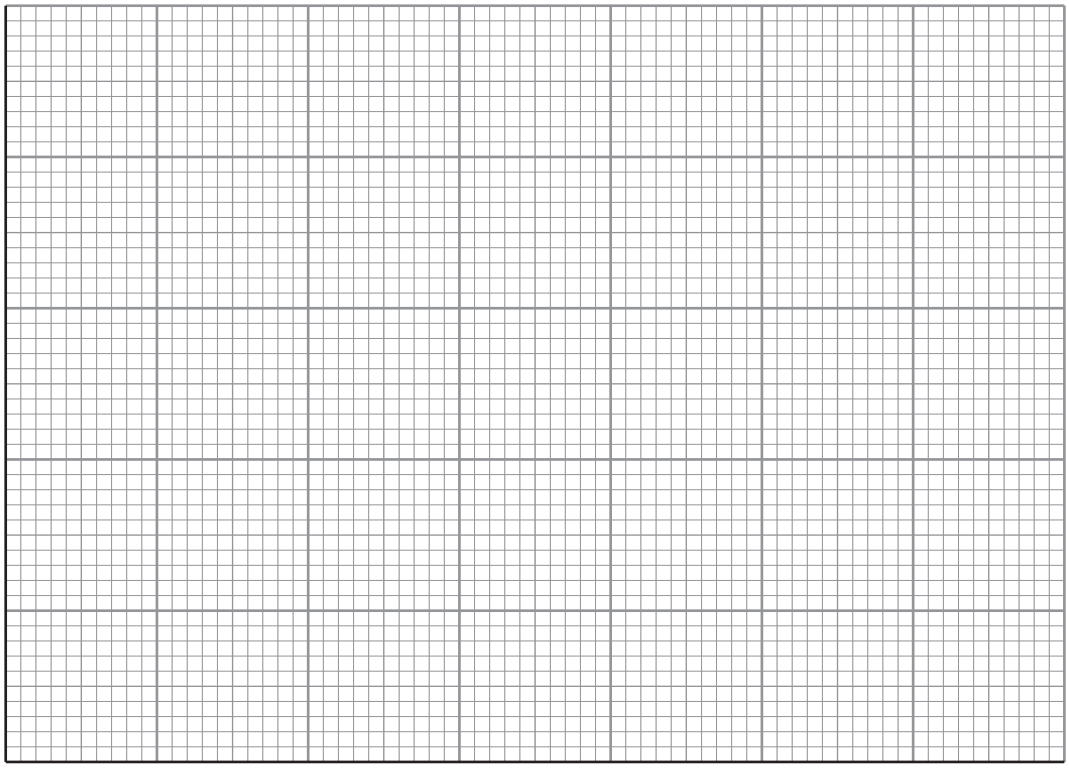
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6. During a day on Anglesey, the wind-speed in miles per hour (m.p.h.), was measured every three hours. The table below shows the information that was recorded.

Time	00:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00
Wind-speed (m.p.h.)	5	3	10	14	15	19	15	11

(a) (i) Draw a time series graph to show the above information.



[4]

(ii) Explain clearly what the graph shows about the wind-speed on Anglesey on this day.

.....

.....

.....

.....

[1]

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(b) Find the mean, median, mode and range of the recorded wind-speeds given in the table on the previous page.

Mean

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.....

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Median

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.....

.....

Mode

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.....

Range

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.....

[7]

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7.



To donate blood you:

- must be aged between 17 and 65;
- must weigh at least 50 kg;
- can only give blood once every 16 weeks or approximately 4 months.

Use the table to decide which of the following people could donate blood today?

	Age	Weight (kg)	Time since last donation
Charlotte	32	66	5 months
Aaron	66	90	20 weeks
Siân	24	48	6 months
Alun	51	82	14 weeks

You must:

- consider each person;
- give a reason why each person could or could not give blood.

Write your answers in the table below.

	Could donate blood today? Yes or No	Reason
Charlotte		
Aaron		
Siân		
Alun		

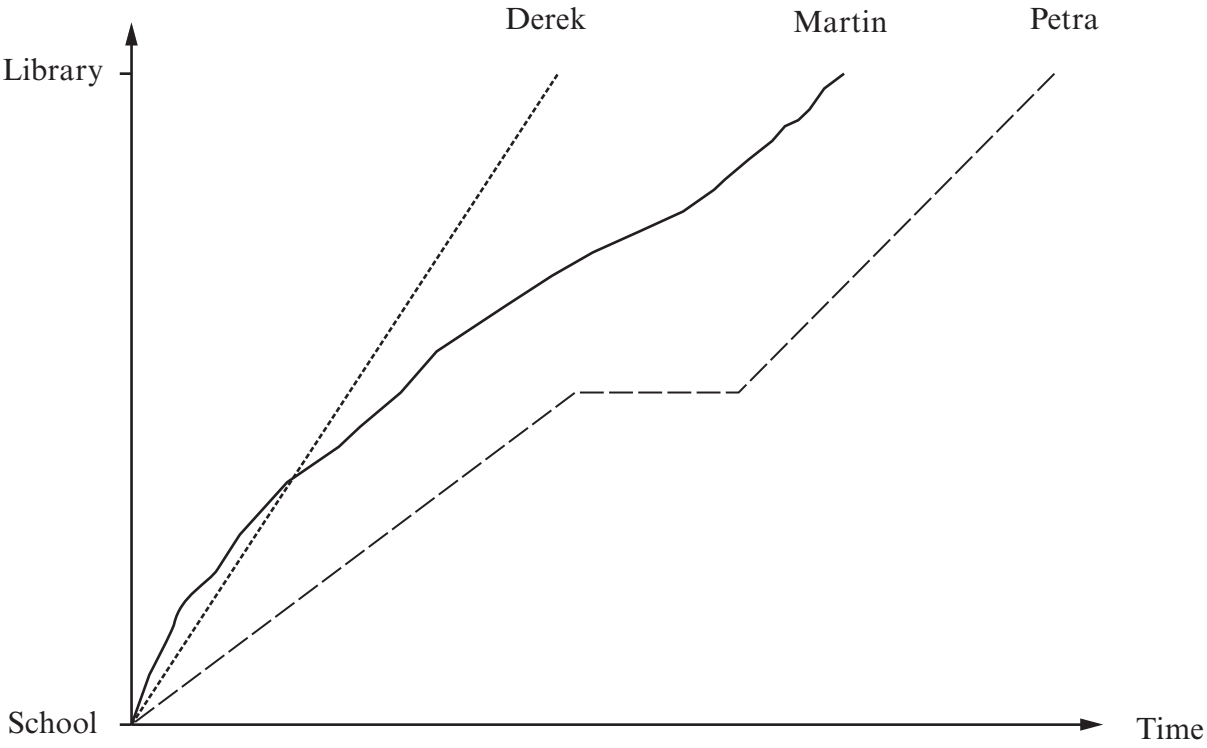
[4]

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8. The following graphs represent the journeys of Petra, Martin and Derek cycling to the library from their school. They all started their journey at the same time.



(a) Who arrived at the library first?

.....

[1]

(b) Who stopped on the way to the library? How does the graph show this?

.....

.....

.....

[1]

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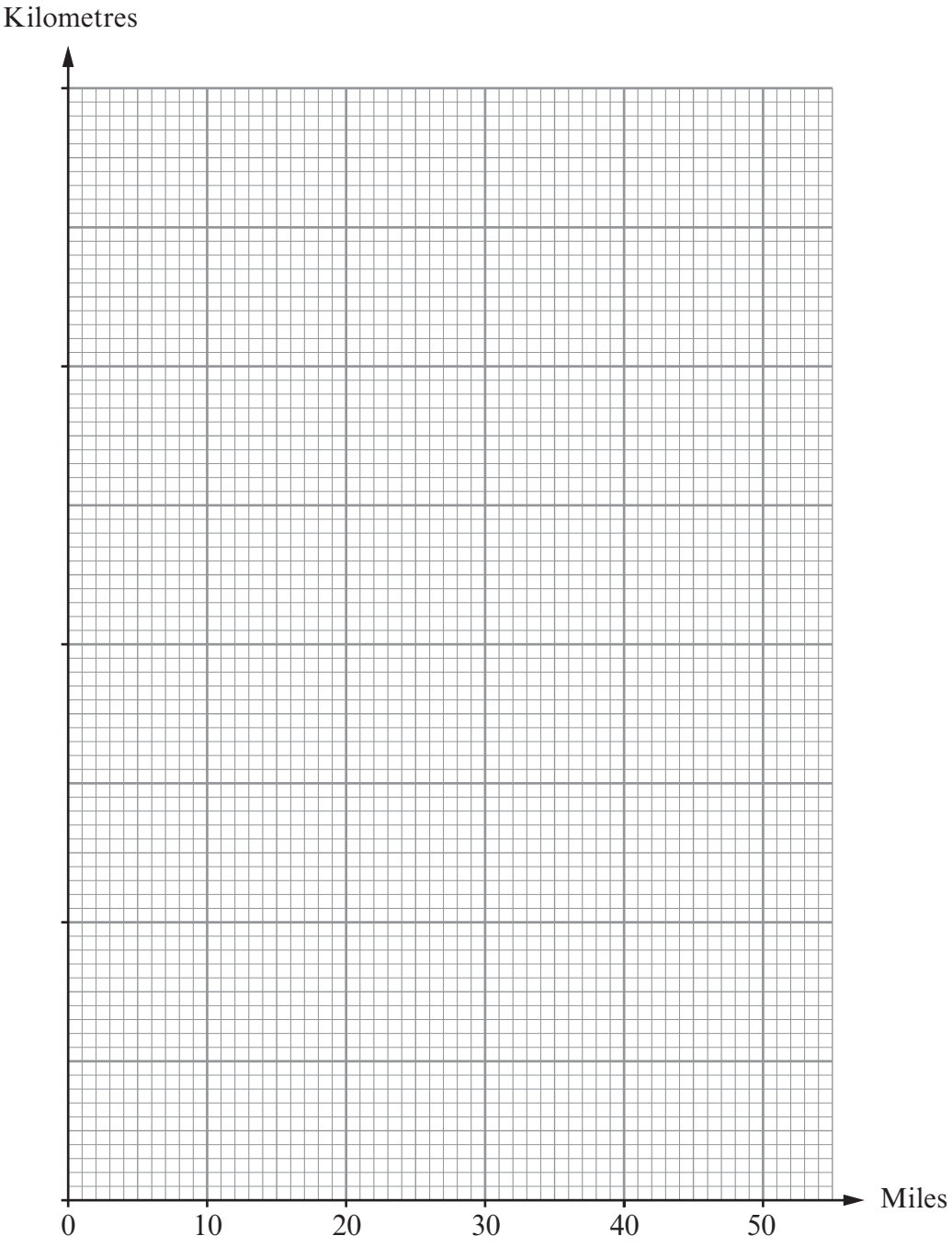
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(c) Martin prefers to measure distances in kilometres rather than miles.
The following table shows the number of miles and the number of kilometres for each of three distances.

Miles	5	30	42·5
Kilometres	8	48	68

(i) Use the data in the table to draw a conversion graph.



[3]

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(ii) The distance between Martin's house and his favourite bicycle shop is 70 miles.

- Explain how he can use the graph to find this distance in kilometres.

.....

.....

- Complete the following sentence:

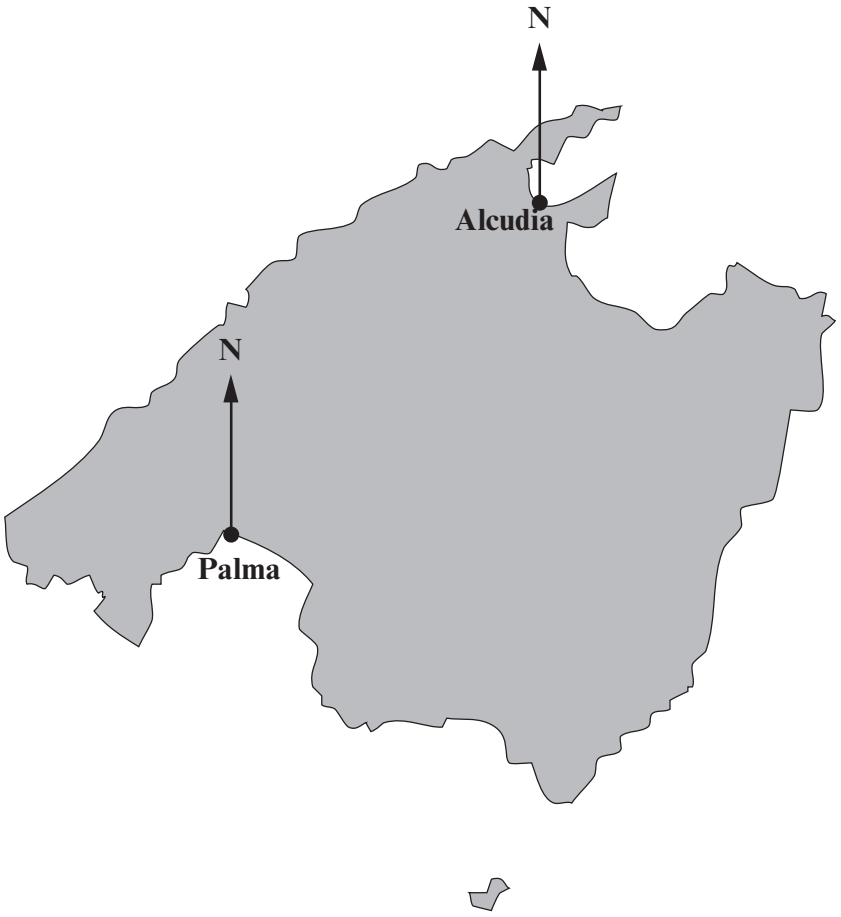
70 miles is approximately ..... km.

[2]

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9. The map below shows the island of Majorca.



(a) Find the bearing of Palma from Alcudia. ..... °

[1]

(b) Arta is another place on the island of Majorca.
Arta is on a bearing of 073° from Palma and on a bearing of 130° from Alcudia.
Indicate where Arta is on the above map of Majorca.

[3]

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(c) A new runway site is being planned for a different island.
A diagram of the plan for the runway site is shown below.

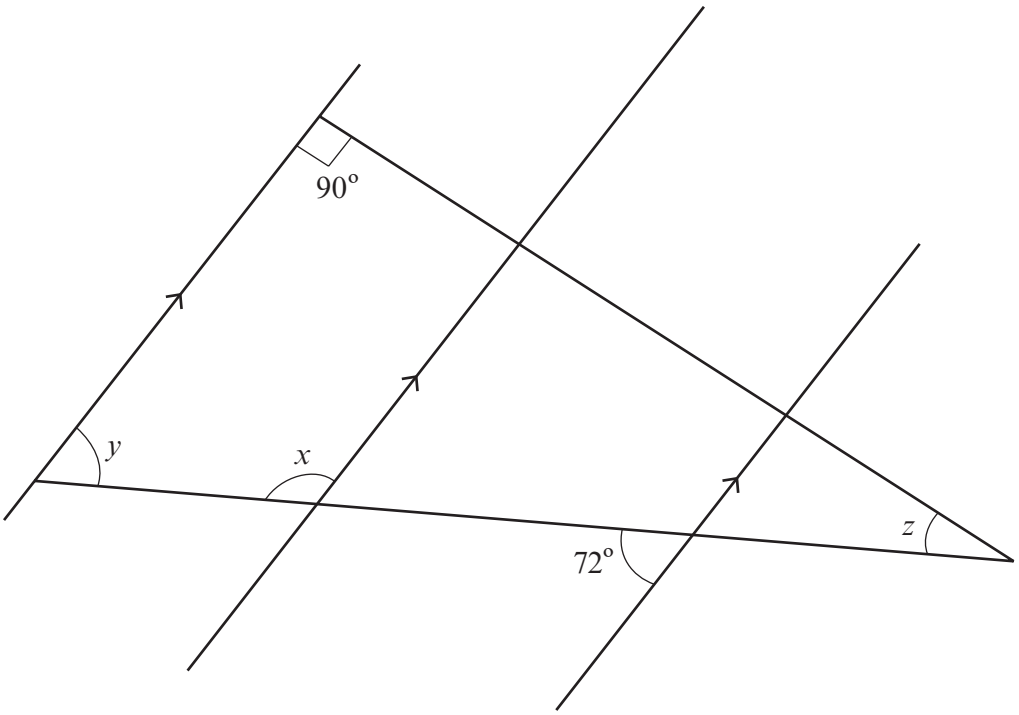


Diagram not drawn to scale

Find the size of the angles x, y and z.

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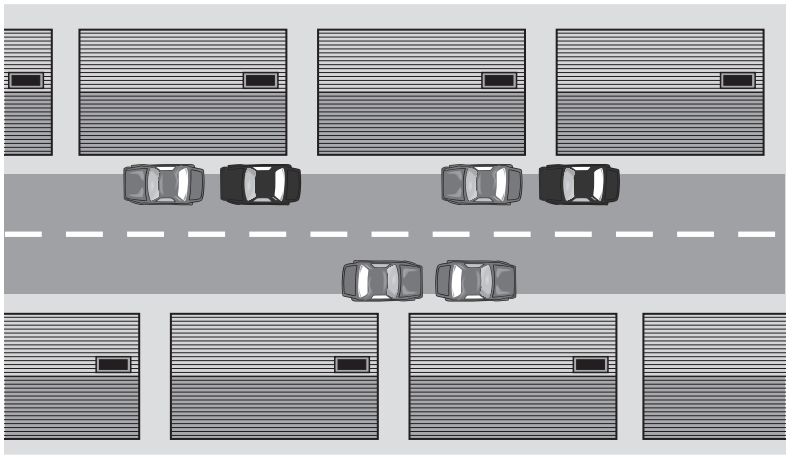
x = ... ° y = ... ° z = ... °

[4]

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10. *(a)* The diagram shows an aerial view of some cars parked in a street in Spain. The scale of the map is not shown.



Using the cars as a guide, complete the following statement.

1 cm represents approximately ..... **metres**

[1]

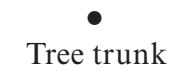
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(b) A different aerial view shows a tree with its branches spreading 2 metres in all directions from the tree trunk.
The tree has many branches and many, many leaves.
Using a scale of 1 cm to represent 0·5 metres, show how this tree would look from an aerial view.

[2]



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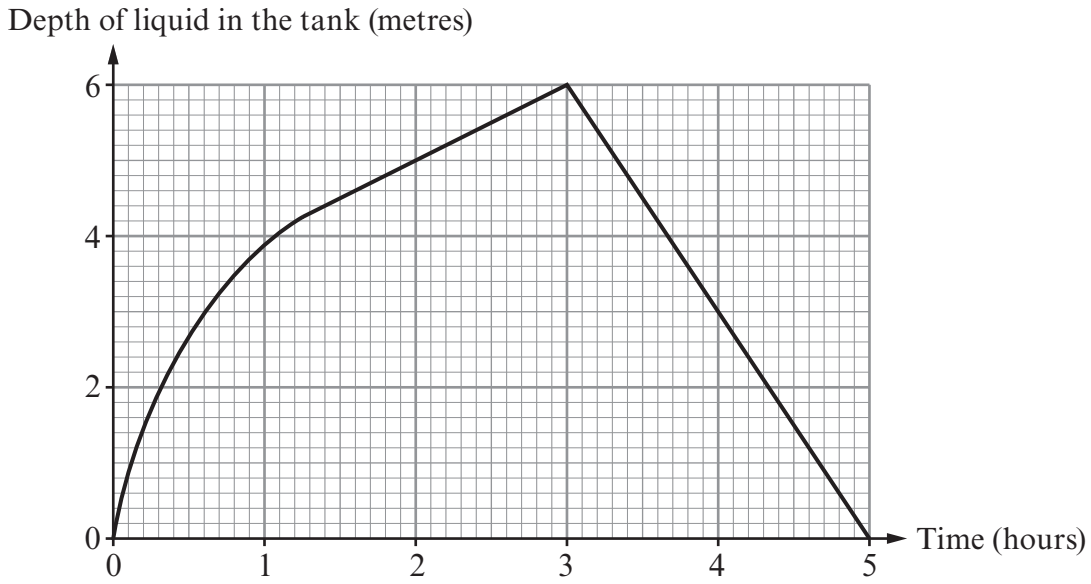
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11. A chemical factory makes a liquid that is used in the production of a waterproof fabric. A cylindrical tank is used to collect the liquid made in the factory.

The moment the tank is full, it starts to empty the liquid into a tanker in readiness for delivery to a company which makes the waterproof fabric.

This process is continuous during the week, but the production stops at weekends for maintenance.

The graph shows the process of the tank being filled and emptied into the tanker.



(a) What is the depth of the liquid in the tank $2\frac{1}{2}$ hours into the process?

..... metres

[1]

(b) How long, in minutes, does it take to half fill the cylindrical tank?

.....

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.....

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[2]

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(c) The tank is left empty over the weekend.
The continuous process starts each Monday at 07:00 by filling the tank.
This process of filling and emptying the tank continues until shutdown on Friday.

(i) Explain what is happening at 20:00 on Monday, giving the depth of the liquid in the tank.

.....

.....

.....

.....

.....

[3]

(ii) The process has to shut down with the tank empty as soon after, but not before, 19:00 on a Friday. At what time should the process shut down on a Friday?
You must show all your working.

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[4]

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 1 (FOUNDATION TIER)

Applications Unit 1 Foundation June 2013		Final
1. (a) (£)5.20 + (£)3.60 (£)8.8(0) (b) (Circuits 5 × (£)4.40 =) (£)22.(00) (Zumba 4 × (£)4.50=) (£)18(.00) (Aqua 3 × (£)4.60=) (£)13.8(0) (Swim) 6 × (£)3.60=) (£)21.6(0) (Total =) (£)75.4(0) (Saves) (£)75.4(0) – (£)33 =(£)42.4(0) Look for • spelling • clarity of labels • the use of notation (watch for the use '=' "£" being appropriate) • 0 consistently missing 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 B2 B1 M1 A1 Q W C 2 <

4. (a) 2/3 × 8652 = 5768 (b) 4120/8 (=515) 2575 (c) Correct explanation	M1 A1 M1 A1 E1 5	 Eg. "because 8652 rounded to the nearest 1000 is 9000" or "because this is a good estimate" or " it's about 9000"
5. **Event** / **Probability** A. Getting a head on a single throw of a coin. — ½ B. Rolling a 4 on a single roll of an ordinary dice. — 1/6 C. Choosing Friday when selecting a day at random from the days of the week. — 1/7 D. Choosing a letter *t* when selecting a letter at random from the word *stamp*. — 1/5 C B D A	 B2 B1 3	 Accept equivalent percentages or decimals *(Do not accept words used to describe probabilities)* Award B1 if 2 or 3 are correct Penalise -1 once only for consistent use of incorrect notation Accept probabilities to represent the events (1/7, 1/6, 1/5, ½) FT their probabilities
6. (a) (i) Correctly labelled axes and uniform scales used Points plotted **Correct** graph drawn with points joined with straight lines (ii) Explanation of graph given (b) Adding numbers (= 92) 92 ÷ 8 Mean = 11.5 (mph) Put in order 3, 5, 10, 11, 14, 15, 15, 19 Median = 12.5 (mph) Mode = 15 (mph) Range = 16 (mph)	B2 P1 L1 E1 M1 m1 A1 M1 A1 B1 B1 12	Award B1 for either both axes labelled correctly or uniform scales on both axes or one axis labelled correctly with a uniform scale. Penalise -1 if axes are reversed. Allow 1 error CAO. Accept solid or dotted lines Eg. The wind speed increases through the morning (and dies down slightly after 1500.) Accept partial explanations. Attempt to add numbers. Accept sight of values from 73 – 111 as evidence of attempting to add FT 'their 92' CAO Sight of 11 and 14 only would gain M1
7. **Person** / **Could donate blood today? Yes or No** / **Reason** Charlotte — Yes — (Meets all requirements) Aaron — No — Is over age limit Sian — No — Is under weight Alun — No — Gave blood less than 16 wks ago	B4 4	Award B1 for each correct response AND valid reason. If Charlotte 'Yes' accept blank space for reason Aaron is 66. Accept 'age'. Sian weighs 48kg. Accept 'weight'. 14 weeks since last gave blood or too soon to give blood. Accept 'time' (since last donation)
8. (a) Derek (b) Petra **and** reason (c) (i)Uniform scale on kilometre axis Plotting at least two correct points **Correct** straight line through points (ii) Full explanation given Approximately 112 (km)	B1 E1 B1 P1 L1 E1 B1 7	 Accept reason implying Petra, e.g. Petra because graph goes flat Eg use of graph or arithmetic method, eg "he could find what 35 miles is in km and then double it". FT their graph Accept answers in the range 110 – 113(km)

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9.(a) 223(°) $\pm$2° (b) Indication of bearing from Palma 073° $\pm$2° Indication of bearing from Alcudia 130° $\pm$2° Arta indicated (by a cross or name) on the map (c) 108 72 180 = 90 + z + 72, or z = x – 90, or z = 90 – y, or equivalent 18	B1 B1 B1 B1 B1 B1 M1 A1 11	 FT provided at least one correct bearing and Arta is on land FT y = 180 - x Provided x is obtuse and y is acute, and neither is 90° CAO
10.(a) Value between 3 (metres) and 5 (metres) inclusive (b) Circle (intention) with radius 4 cm $\pm$ 2mm drawn	B1 B2 3	 Accept a suitable sketch where clearly the branches are drawn to scale of 4cm $\pm$ 2mm Many branches (covering much of the region) shown within tolerance is sufficient – circumference may not be shown B1 for circle with radius other than 4cm $\pm$ 2mm, or suitable sketch with overall idea of 4cm $\pm$ 2mm radius, or a few branches shown within the tolerance
11. (a) 5.5 (metres) (b) Intention to read horizontal scale for depth of 3m filling 36 (minutes) (c)(i) Use of the 5 hour period Looking 3 hours into the period or equivalent Depth is 6(m), or statement that the tank is full (ii) Strategy to work out how many hours between 0700 Monday and a time on Friday 96 hours to 0700 Friday or 108 hours to 1900 Friday or another correct number of hours from 0700 Monday to a time on Friday Interpretation of a stop time, e.g. ‘3 hours into the process’, or ‘2 more hours’ (Finish time for process is) 21(:)00 or 9pm	B1 M1 A1 S1 B1 E1 S1 B1 B1 B1 10	Accept answers in the range 5.4 to 5.6 inclusive e.g. ‘2 cycles and 3 hours’ Accept e.g. ‘ready for emptying into tanker’, etc e.g. 0700 Mon to 0700 Friday, 4 lots of 24 hours OR working with multiples of 5 hours, or other suitable multiples of hours Allow from 1 slip in adding on time. Or other appropriate correct statement CAO. Or other appropriate correct statement Final B1 implies previous B1 Award all 4 marks for a response of 2100 only if no incorrect working seen, i.e. not a lucky correct answer *If no marks, award SC1 for an answer of 2200 (10pm) by starting at 0700 each day*

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UNIT 1 (HIGHER TIER)

Applications Unit 1 June 2013 Higher Tier		Final
1.(a) 9cm, 8cm and 5cm lines in correct orientation	B1	±2mm on all lengths *No arcs no marks!*
60°±2° constructed using the appropriate arcs	B2	B1 for appropriate arcs but angle slightly outside the tolerance, or for at least one arc correct with the other slightly outside of tolerance together with angle attempted, or for full method clearly attempted
90°±2° by appropriate compasses construction	B2	B1 for appropriate arcs but angle slightly outside the tolerance, or for full method clearly attempted If no construction arcs shown, then B0 apart from first B1 for the lengths
	5	
2.(a) 223(°) ±2°	B1	
(b) Indication of bearing from Palma 073° ±2°	B1	
Indication of bearing from Alcudia 130° ±2°	B1	
Arta indicated (by a cross or name) on the map	B1	FT provided at least one correct bearing and Arta is on land
(c) 6 cm ±2 mm measured	B1	
54÷6 or 9 (km) or 1cm: 9(km)	M1	FT 54÷ 'their 6'. Accept method with incorrect place value
(1cm :) 9000 (m)	A1	
(d) 108	B1	
72	B1	FT y = 180 - x
180 = 90 + z + 72, or z = x – 90, or z = 90 – y, or equivalent	M1	Provided x is obtuse and y is acute, and neither is 90°
18	A1	CAO
	11	
3(a) Value between 3 (metres) and 5 (metres) inclusive	B1	
(b) Circle (intention) with radius 4 cm ± 2mm drawn	B2	Accept a suitable sketch where clearly the branches are drawn to scale of 4cm ± 2mm Many branches (covering much of the region) shown within tolerance is sufficient – circumference may not be shown B1 for circle with radius other than 4cm ± 2mm, or suitable sketch with overall idea of 4cm ± 2mm radius, or a few branches shown within the tolerance
	3	
4(a) 8 mm	B2	B1 for an answer of 8, or for an answer between 6 and 9 inclusive (excluding 8) with mm given
(b) (i)Method, e.g. increase in L / increase in W	M1	Or idea of alternative complete method
e.g. 12/150 (= 0.08)	A1	Accept sight of quotient based on misread of the scale for M1 only. Or alternative complete method with accurate values Mark final answer.
(ii) Full explanation, e.g. 'rate of change length with weight', 'for every 1g increase 0.08mm increase'	E2	E1 for mention of 'rate of change' without being specific, e.g. '1g gives 0.08mm'. Allow 'length increases as weight increases' for E1only
(c) Explanation, e.g. 'no more data recorded', 'spring snaps', 'broken spring', 'spring now completely straight', etc	E1	
(d) $L = 2W + 35$	B3	B2 for either of 2 or 35 correctly placed, or B1 for a correct interpretation of data given, e.g. sketch shows start (0,35) and end (100, 235)
	10	
5(a) 210÷30 (=7)	M1	OR using 1:4:10 to find 210÷15 (=14)
14, 56, 140 in this order	A2	A1 for any one answer correct, or for 14, 56 and 140 in an incorrect order
(b) $T = 15x$	B3	B2 for (T=) $x + 4x + 10x$, or B1 for sight of $4x$ or $10x$ OR 4 and 10
(c) $8P/30$ ($= 4P/15$)	B2	Mark final answer. B1 for 8/30 or P÷30 or P/30 or from simplified ratio P÷15 or P/15 *If no marks, SC1 for sight of 'P = 3.75×variable' or equivalent*
	8	
6.A uniform scale used (shown) at least 30 to 140 with idea of box-and-whisker plot AND with label '£'	B1	
Range of whiskers correct	B1	
Lower and upper quartiles used as ends of the box	B1	
Median shown correctly within the box	B1	
	4	Award B4 for a correct response

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7(a) 5.5 (metres) (b) Intention to read horizontal scale for depth of 3m filling 36 (minutes) (c)(i) Use of the 5 hour period Looking 3 hours into the period or equivalent Depth is 6(m), or statement that the tank is full (ii) Strategy to work out how many hours between 0700 Monday and a time on Friday 96 hours to 0700 Friday or 108 hours to 1900 Friday or another correct number of hours from 0700 Monday to a time on Friday Interpretation of a stop time, e.g. '3 hours into the process', or '2 more hours' (Finish time for process is) 21(:)00 or 9pm Look for • relevance • spelling • clarity/flow of text explanations QWC2: Candidates will be expected to • present work clearly, with words explaining choices 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 choices OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	B1 M1 A1 S1 B1 E1 S1 B1 B1 B1 QWC 2 <

10(a) 2^{-3} (b) $2^{0.12}$ (c) 2^{9}	B1 B1 B2 4	 Accept $2^{12/100}$ or equivalent B1 for sight of $8^{12/4}$ or $8^{1/4 \times 12}$ or 8^{3} or $(2^{3})^{3}$ or $(2^{3})^{1/4\times12}$ or equivalent *If a candidate writes only the index, penalise -1 once only on the first occasion*
11. Idea to find 4 areas of strip width ½ hour 2 + 4.75 + 5 + 4 15.75 km	B1 M2 A1 U1 5	 M1 for any 2 of the 4 areas correct, or '2 of their areas' correctly evaluated from an incorrect interpretation of the scale or of the ½ strip requirement, e.g. use of 4 or 30 for the horizontal Other A marks are included by sight of 15.75 Only award A1 for correct calculation based on 4 strips to 14:00 Independent mark. Accept other units from appropriate calculations
12(a) Entries in frequency table: 32 and 28 Histogram: 12 to 16 f.d. **10**, 20 to 30 f.d. **2** (b) 8 (light bulbs) (c) Identifying that the answer is in the range >8 and ≤12 Realise need 8 of the 32 ($8<t\leq12$) or 1/4 of the entry for $8< t \leq 12$ (y =) 9 or 9 hundred hours or equivalent	B2 B2 B1 M1 M1 A1 8	B1 for each correct entry B1 for each correct bar Maybe shown on the histogram. FT from their 32 entry, provided it is >8 Maybe shown on the histogram. FT from their 32 entry, provided it is >8 CAO
13(a) Suitable strategy to find b, e.g. attempt to sketch or by some substitution Either $0 = -5^2 + b\times 5$ or $6.25 = -2.5^2 + b\times 2.5$ $b = 5$ $y = -x^2 + 5x$ (b) Method to find c, e.g $0 = -6^2 + c \times 6$ $c= 6$ Use $y = -x^2 + 6x$ when $x = 3$ (Max height found) y = 9 (metres) Correct sketch with the 3(m across to max ht.) and 9(m height)	S1 M1 A1 A1 M1 A1 M1 A1 B1 9	Accept substitution with use of at least one of the values given but with incorrect interpretation Accept interpretation of $-x^2$ as $(-x)^2$ for M1 only FT their b provided M1 awarded Do not award previous 4 marks for a correct sketch based on spurious or incorrect working.

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Surname	Centre Number	Candidate Number
Other Names		0

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4361/01

APPLICATIONS OF MATHEMATICS

UNIT 1: Applications 1
FOUNDATION TIER

P.M. TUESDAY, 15 January 2013

$1\frac{1}{2}$ 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 **9**.

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

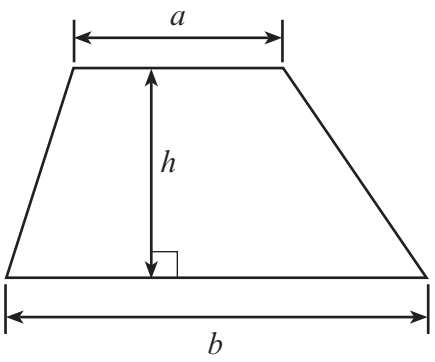
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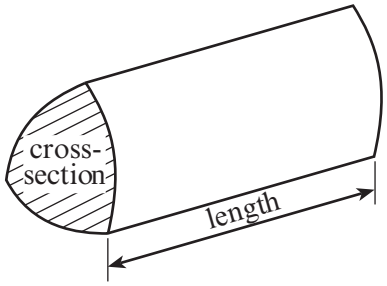
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Formula List

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



Volume of prism = area of cross-section × length



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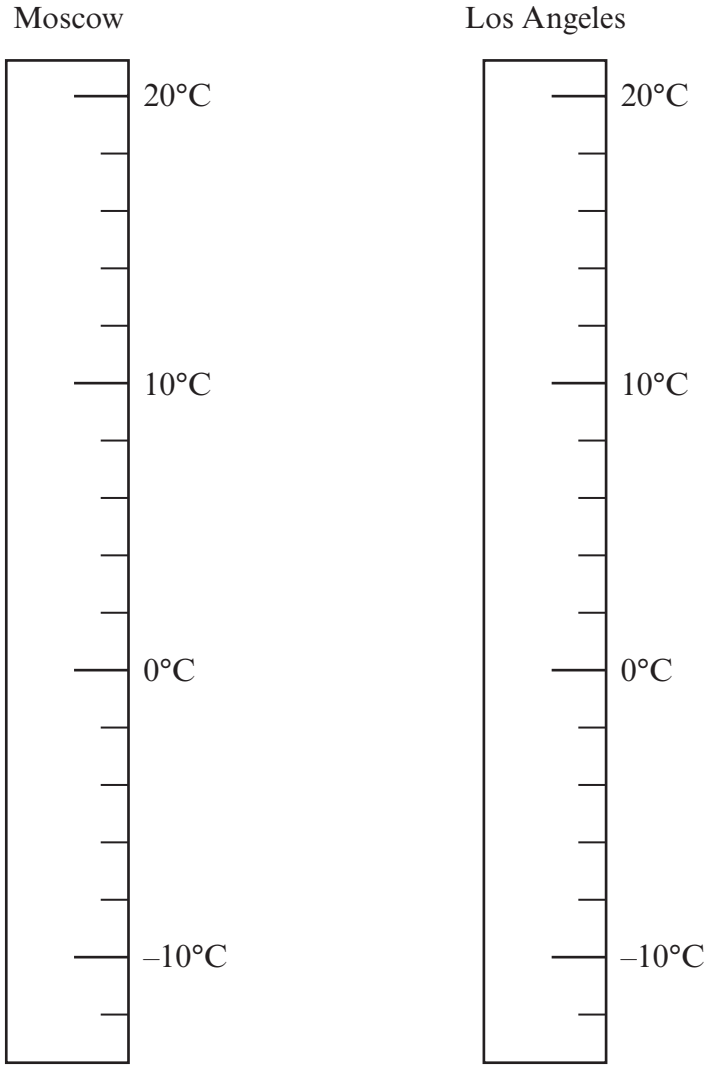
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1. An airport displays the daily midday temperatures of cities around the world.
On a particular day in January, the midday temperature in Moscow was –8°C and in Los Angeles was 13°C.

(a) Mark clearly the temperature of each city on the scales below.

[2]



(b) Work out the difference in temperature between the two cities.

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[1]

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Turn over.

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2. In a class, pupils were having a discussion about factors, multiples, square numbers, prime numbers and powers.

(a) The first discussion was between Siân and David.
Siân said, "5 is a factor of 10."
David said, "5 is a multiple of 10."

Who is correct? Explain your answer.

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Who is incorrect? Explain your answer.

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[2]

(b) (i) The second discussion was between Sioned and Lewys.
Sioned said, "When you square a whole number, you always get an even number."
Is Sioned correct? Explain your answer.

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[1]

(ii) Lewys said, "15 is a prime number."
Is Lewys correct? Explain your answer.

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[1]

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(c) Osian said, "2 to the power of 3 is 6."
Explain why Osian is incorrect.

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[1]

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3.



A rock band holds a concert at 5 different venues.
The table below shows the number of tickets sold for each concert.

Concert Venue	Number of tickets sold
Freedom Arena	18 535
Eastpoint Arena	26 750
Gate Park	19 125
Greenfields Arena	15 400
City Stadium	28 960

Each ticket costs £24.

Showing all of your working, calculate the total amount of money from the ticket sales.
Round your answer to the nearest £100.

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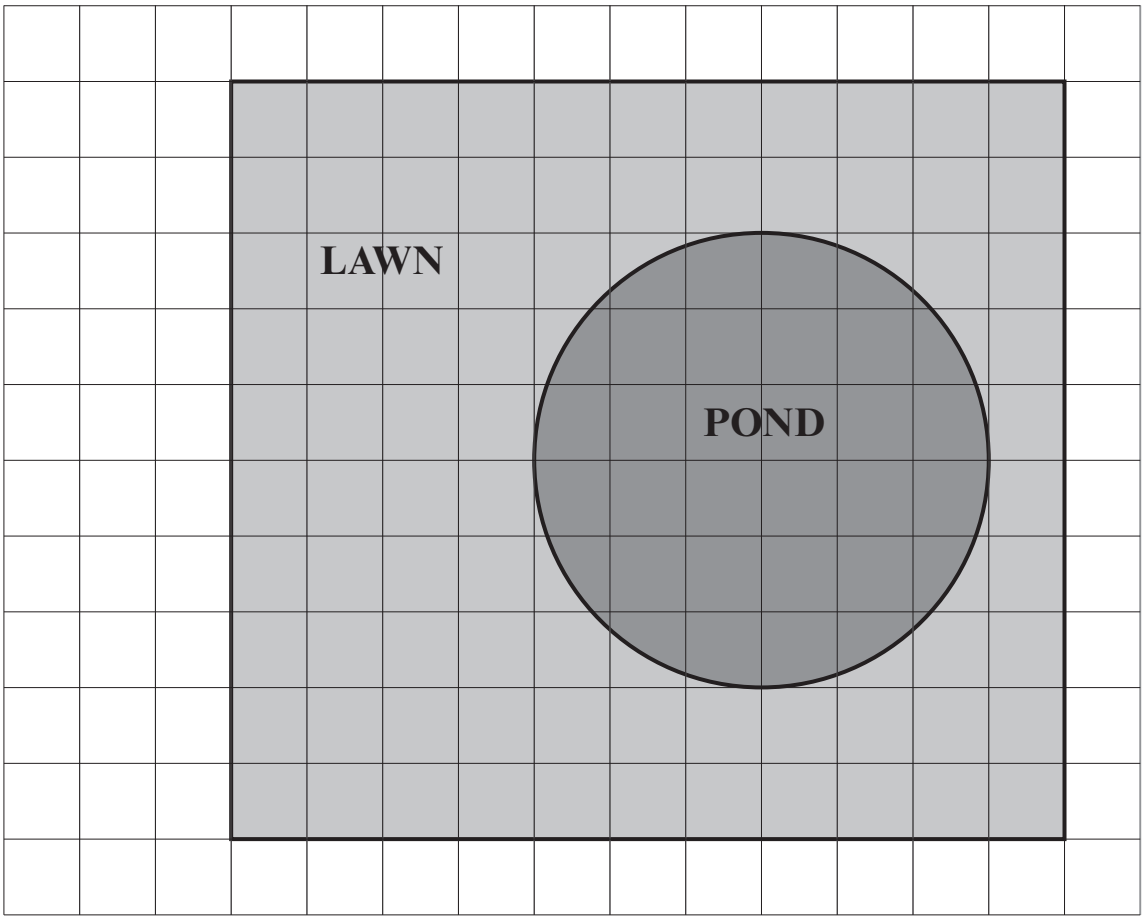
[4]

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4. The following diagram, drawn on a centimetre square grid, represents a design of a rectangular garden with a circular pond.



(a) Estimate the surface area of the pond drawn on the grid.

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[2]

(b) Once the circular pond has been completed, the rest of the garden is to be made into a lawn.
Every square on the grid represents an area of 5 m^2.
Estimate the actual area of the lawn.

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[3]

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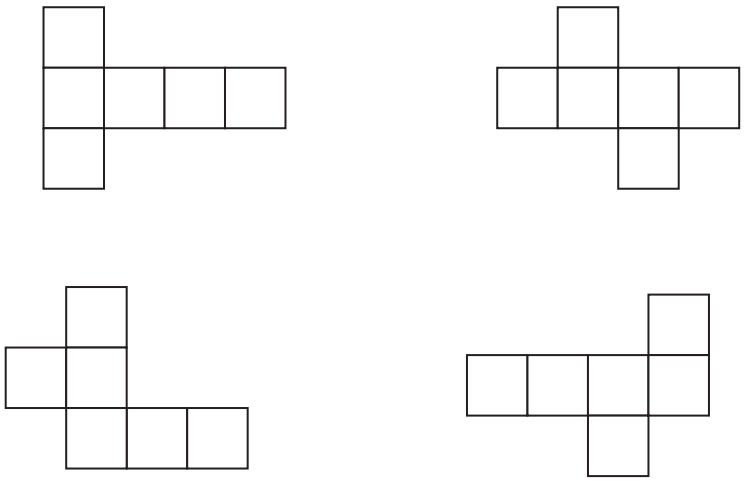
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5. A jewellery shop wishes to create boxes, in the shape of cubes, to use for packaging gifts.

(a) Which one of the following patterns **cannot** be used to form a box in the shape of a cube?
Circle your answer.

[1]



(b) The jewellery shop wants to cover all the sides of a box with paper.
The box is a cube with sides 7 cm.

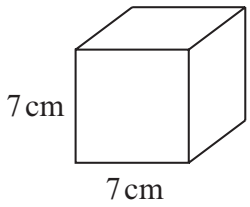


Diagram not drawn to scale

What is the total area of all the faces of this box?
State the units of your answer.

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.....

[4]

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6. Jim and Andy play for their local cricket team.
They scored the following runs in their last six matches.

Jim	42	71	39	62	70	40
Andy	115	6	84	36	10	85

(a) Calculate the mean of Andy's scores.

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Mean is .....

[3]

(b) Find the median of Jim's scores.

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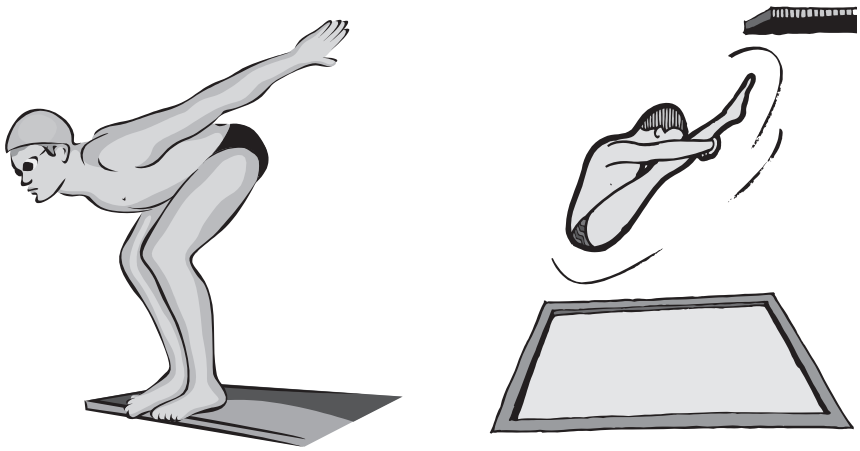
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7.



In a diving competition, the final score for a dive depends on:

- the degree of difficulty of the dive;
- the total of the marks awarded by 5 judges.

The formula for working out the final score is shown below.

Final score = 0·6 x degree of difficulty x total of the judges' marks

(a) Tim does a dive with a degree of difficulty of 3·8.
The judges' marks have a total of 32·5.
What is the final score for Tim's dive?

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[2]

(b) For Tim to win the competition he will need a score of 100·8 from his final dive.
Tim's final dive has a degree of difficulty of 4·2.
For Tim to score 100·8, what does the total of the judges' marks need to be?

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[2]

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8.

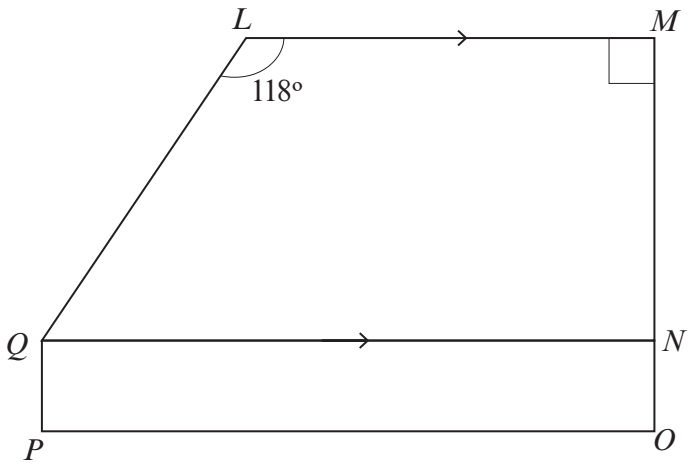


Diagram not drawn to scale

The diagram shows the side of a rabbit's hutch.
LM is parallel to QN.
$PQNO$ is a rectangle.
The angle $Q\hat{L}M$ between the top of the hutch and the front is 118°.

(a) Calculate the size of the angle $L\hat{Q}P$.

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[4]

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(b) The rabbit's hutch needs a circular hole, of radius 4 cm, cut out to create space for a water bottle.
Draw a circle with a radius of 4 cm below.

[1]

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(c) On the roof of the hutch, a small opening is used to place food inside for the rabbit. The opening is in the shape of a trapezium, as shown in the sketch below.

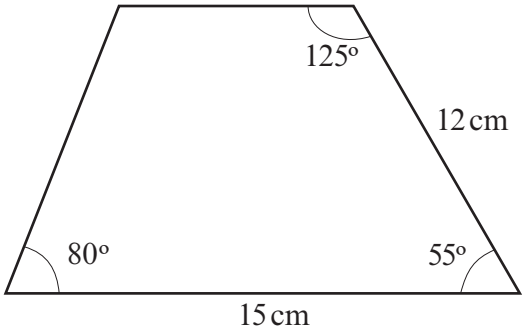
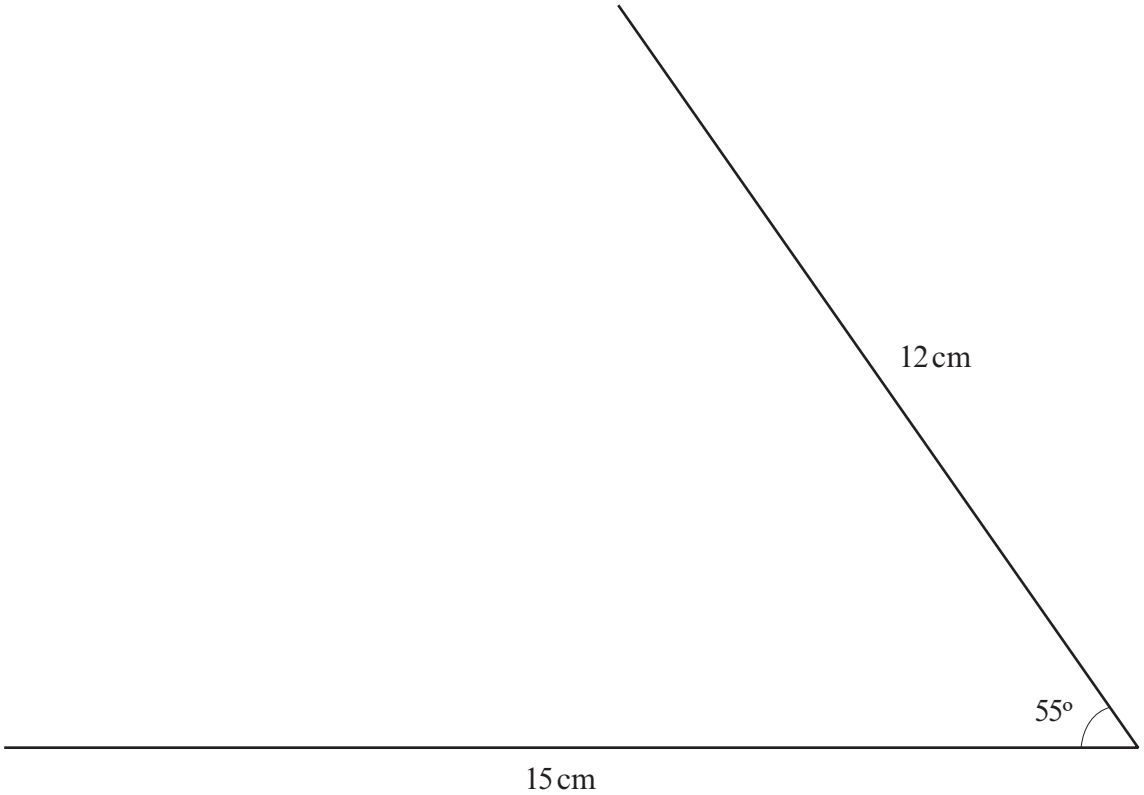


Diagram not drawn to scale

Complete an accurate drawing of the trapezium.
Two of the sides have already been drawn for you.

[2]



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

Three friends Andrea, Ravinder and Erika visit a restaurant for lunch.
Part of the menu is shown below.

PRICES

Tea/Coffee/Soft drinks	small £1.45 large £1.90
Soup & a sandwich	£5.95
Chicken pie, mash & vegetables	£8.75
Vegetable lasagne, salad & garlic bread	£7.50
Cod in batter, mushy peas & chips	£9.30
Beef chilli, sour cream & nachos	£8.70

Andrea has cod in batter, mushy peas and chips and a small coffee.
Ravinder has a large soft drink, soup and a sandwich.
Erika has a large tea, chicken pie, mash and vegetables.

They share the total bill equally between them.

Showing all your working, explain clearly who benefits the most from not paying their own individual bill and how much she will save.

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[8]

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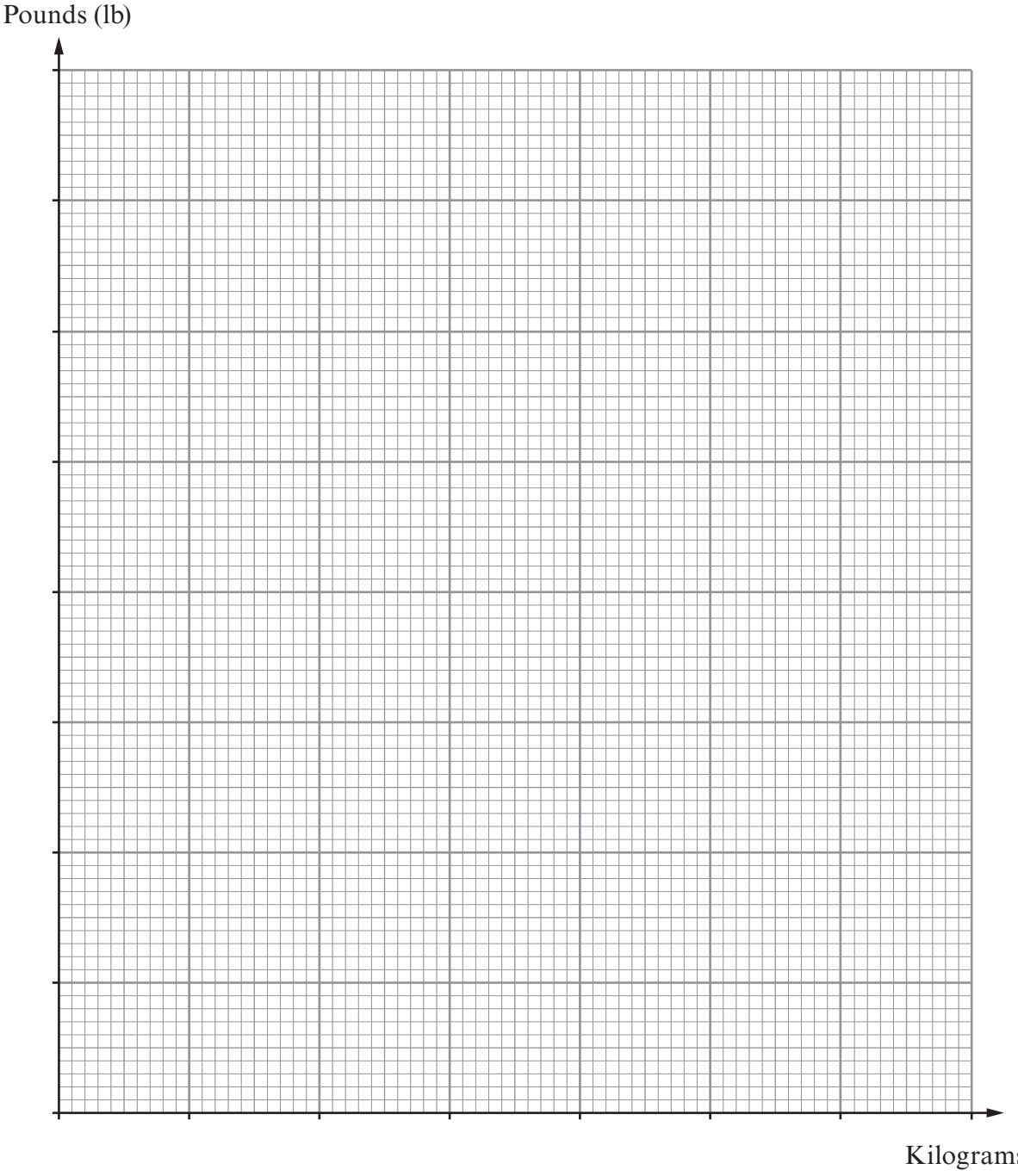
Examiner only

10. In a hospital clinic the following information is used to convert between kilograms (kg) and pounds (lb).

Kilograms (kg)	0	39	68
Pounds (lb)	0	86	150

(a) Use the information in the table to draw a conversion graph.

[2]



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(b) Use your graph to find an estimate for 50 kilograms in pounds.

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[1]

(c) Find an estimate for 200 pounds in kilograms.

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[2]

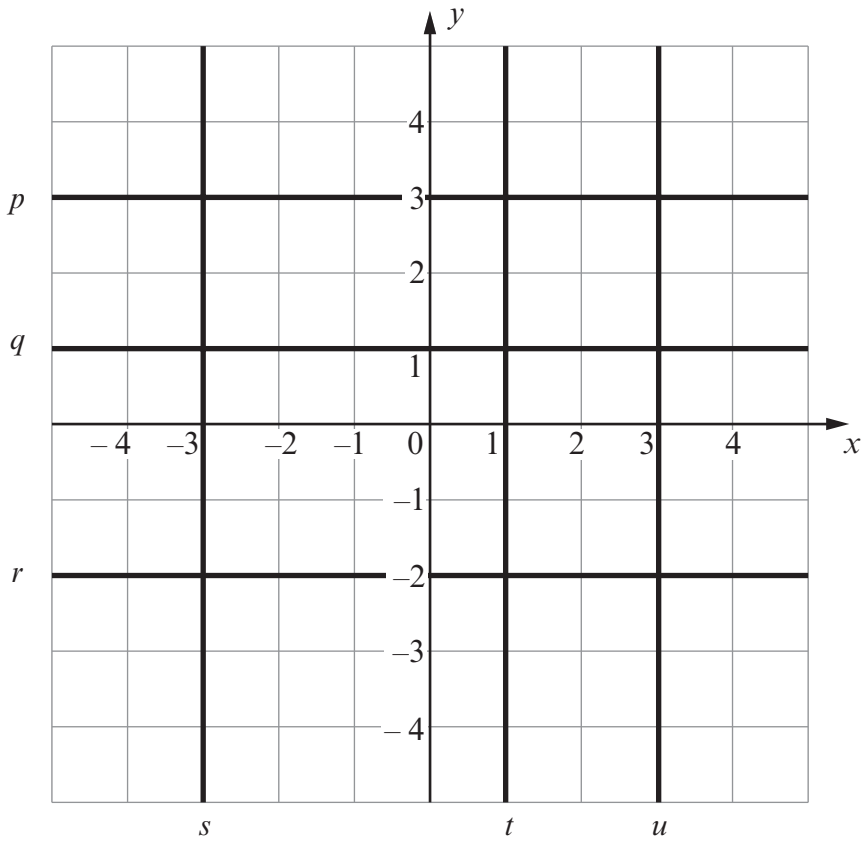
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11. As part of her homework, Nia was asked to identify straight lines drawn on the coordinate grid shown below.



(a) Which of the lines *p, q, r, s, t* or *u* shown on the grid represent the following equations?

$y = 1$ is line .....

$x = -3$ is line .....

[2]

(b) Nia was also asked to draw the line $y = 2x - 1$.

(i) Complete the table below for this line.

x	–2	–1	0	1	2	3
$y = 2x - 1$	–5		–1	1		5

.....

.....

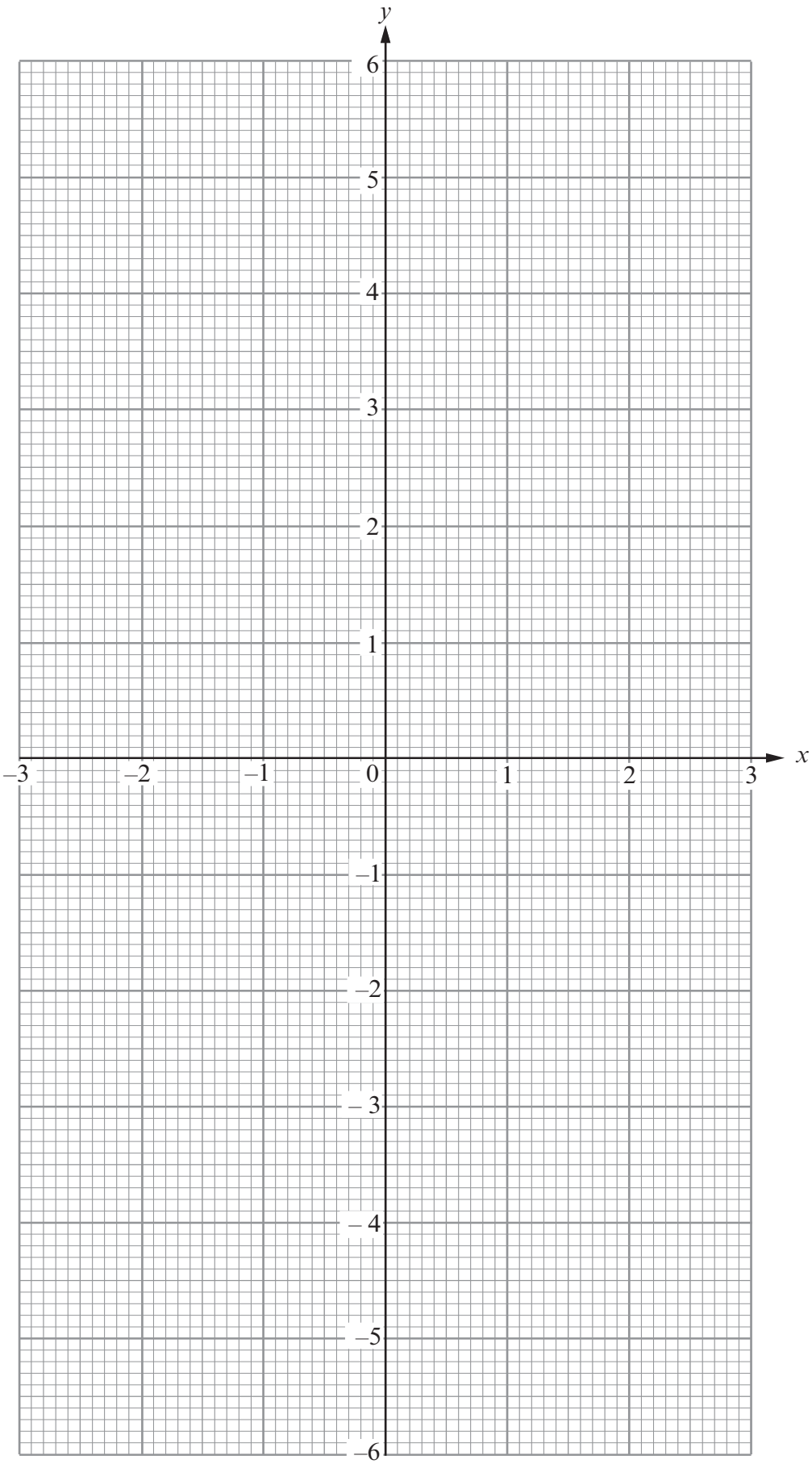
[2]

(ii) On the graph paper on the opposite page, draw the graph of $y = 2x - 1$.

[2]

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12. Owen works in a DIY warehouse.
He is asked to sort some tiles.
He has the following shapes of tiles to sort.

Square Kite Rhombus Parallelogram

(a) He is asked to sort the tiles using the table shown below.
Complete the table.

Tiles with equal diagonals	All other tiles

[2]

(b) Owen is then asked to sort the tiles differently using the table shown below.
Complete the table.

Tiles with opposite sides parallel	All other tiles

[2]

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13. Write down expressions for each of the following.

(a) The total cost, in pence, of 3 buttons at e pence each and 2 sewing needles at f pence each.

.....

.....

.....

[2]

(b) The total cost of these buttons and needles in pounds.

.....

.....

[1]

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14. Danny is setting out a treasure hunt.
The first clue is found 300 m from the start on a bearing of 120°.
The second clue is found 360 m from the position of the first clue on a bearing of 040°.
The third clue is found 100 m from the position of the second clue on a bearing of 280°.

(a) Using a scale of 1 cm to represent 40 m, complete an accurate scale drawing of the treasure hunt route, showing the positions of the three clues.

[5]



(b) Write down the bearing of the start from the position of the first clue.

.....

[1]

(c) Write down the distance and the bearing of the start from the position of the third clue.

.....

.....

Distance ..... m

Bearing ..... °

[2]

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15. A survey is to be carried out to find out how popular MP3 players are across the various age groups of the general population.
The survey is carried out by asking people questions as they come out of a cinema.
Two questions from the survey questionnaire are shown below.

1. How old are you?

Put a tick in the box

under 10	☐
10 to 20	☐
20 to 30	☐
older than 30	☐

2. Do you own an MP3 player?

Put a tick in the box

Yes	☐
No	☐

(a) Is this a biased survey? Give a reason for your answer.

.....

.....

.....

.....

[1]

(b) State a criticism about the design of question 1 in the survey.

.....

.....

.....

[1]

(c) Write a question, with a selection of answer boxes, to find out how much people are prepared to pay for MP3 players.

.....

.....

.....

.....

.....

[2]

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(d) If you were to use your question to carry out a survey by asking 100 people today and again tomorrow, would you expect to get exactly the same results? Give a reason for your answer.

.....

.....

.....

.....

[1]

(e) A different survey was carried out to find the favourite colour of MP3 players. The results are shown in the table below.

	Number of people		
Favourite colour of MP3 player	The first 20 people asked	The second 20 people asked	The third 20 people asked
Red	2	5	8
Black	5	4	3
Silver	13	11	9

(i) Did any person answering the survey have a favourite colour of MP3 player other than red, black or silver? Give a reason for your answer.

.....

.....

.....

[1]

(ii) Calculate the best estimate for the probability that one of the people answering the survey, selected at random, says that their favourite colour of MP3 player is black.

.....

.....

.....

[2]

END OF PAPER

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GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2013

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INTRODUCTION

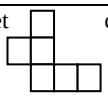
The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly 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 1 - FOUNDATION TIER

Applications Unit 1 Foundation Tier January 2013		Final
1. (a) Moscow at -8°C Los Angeles at 13°C (b) 21(°C)	B1 B1 B1 3	 Accept between 12 and 14 exclusive Accept -21(°C)
2.(a) Sian AND valid explanation eg "5 divides (exactly) into 10" David AND valid explanation eg "5 isn't in the 10 times table" or "10 is a multiple of 5" or "5 is a factor of 10" (b)(i) No AND valid explanation eg "No because 3^2 is 9" or "when you square an odd number you get an odd answer" (ii) No AND valid explanation eg "No because 3 × 5 = 15" or " 3(or 5) goes into 15" or " 3(or 5) is a factor of 15" (c) Valid explanation eg. (2^3 =) 8 or " it's 2 × 2 × 2 not 2 × 3	E1 E1 E1 E1 E1 5	Sian may be implied from valid explanation. Do not accept "Sian is correct because 5 is a factor of 10." David may be implied from valid explanation No may be implied No may be implied
3. total ticket sales = 108770 Cost of tickets = 108770 × 24 (£) 2610480 2610500	B1 M1 A1 B1 4	 FT their 108770 FT 'their 2610480' rounded to the nearest 100 *Alternative method* *18535 × 24 + 26750 × 24 + 19125 × 24 + 15400 × 24 + 28960 × 24 M2* *(444840 + 642000 + 459000 + 369600 + 695040)* *Award M1 for multiplying at least 3 of the number of tickets at each venue by 24 with an intention to add OR for multiplying all 5 of the number of tickets at each venue by 24 with no intention to add* *(£)2610480 A1* *2610500 B1* *FT 'their 2610480' rounded to the nearest 100 for last B1*
4. (a) For attempting to count squares Accept in range 24 to 32 (centimetre squares) (b) Area of lawn in range 78 to 86 Their area × 5 Area in range 390 to 430 (m^2)	M1 A1 B1 M1 A1 5	Accept use of πr^2 M1 for correct method, $\pi \times 3^2$ A1 for correct answer. 28 – 28.3 ISW if their pond area × 5 FT 110 (area of rectangle) – their (pond)(a) FT their area *If no marks awarded in (b) award SC1 for sight of 550 (implies × 5)*
5. (a) Correct net  circled or clearly indicated (b) Area of one face = 49 (cm^2) Total surface area = 49 × 6 = 294 cm^2	B1 B1 M1 A1 U1 5	 FT their 49 but not 7
6. (a) Mean for Andy = 336 ÷ 6 = 56 (b) Put in order 39, 40, 42, 62, 70 71 Median of Jim = 52	M1 m1 A1 M1 A1 5	Attempt to add all given values for Andy FT 'their 336' CAO Sight of 42 and 62 only would gain M1

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Applications Unit 1 Foundation Tier January 2013		Final
7. (a) S = 0.6 × 3.8 × 32.5 = 74.1 (b) Marks = 100.8 ÷ (4.2 × 0.6) = 40	M1 A1 M1 A1 4	
8. (a) Angle LQN = 180 – 118 = 62(°) Angle LQP (= 62 + 90) = 152(°) (b) circle drawn with radius 4cm (c) 125° or 80° drawn Accurate completed shape	 M1 A1 B2 B1 M1 A1 7	Look at diagram, may be seen or implied Or 360 – (118 + 90 + 90) FT their 62. Award B1 for angle PQN = 90(°) (may be on diagram) *Alternative method* *Sum of interior angles of pentagon = 540 (°) B1* *Angle PON or QPO = 90(°) B1* *540 – (118 + 90 + 90+ 90) M1* *152(°) A1* ±2mm ±2°
9. (Andrea) (£)10.75 (Ravinder) (£)7.85 (Erika) (£)10.65 (Total Bill) (£)29.25 (Each pays) 29.25 ÷ 3 (£)9.75 Andrea(benefits the most) by (£)1(.00) Look for • Spelling • Clarity of text explanation • the use of notation, watch for the use of '=', '£', ÷ 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	B2 B1 M1 A1 A1 QWC 2 8	Award B1 for any 2 of Andrea, Ravinder & Erika correct. FT their '10.75 + 7.85 + 10.65' (£)29.25 implies B2 B1 FT their total bill (£)9.75 implies all previous marks FT their values. Unsupported correct answer implies all previous marks. 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.
10. (a) Plotting at least two correct points Correct straight line through points (b) Approximately 110 (lbs) (c) Clear method shown Approximately 91 (kg). Accept answers in range 85 - 95	P1 L1 B1 M1 A1 5	 FT their graph, within 1 small square Accept use of graph or 200 ÷ 2.2 or other valid method. FT their line Award SC1 for unsupported answers in the ranges 80 – 84.9 or 95.1- 100 Incorrect answers from a correct method but still in range award M1 A0

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Applications Unit 1 Foundation Tier January 2013		Final
11. (a) (y = 1 is line) q (x = -3 is line) s (b) (i) x | -2 | -1 | 0 | 1 | 2 | 3 y=2x - 1 | -5 | **-3** | -1 | 1 | **3** | 5 (ii) Plotting points correctly Correct line drawn	B1 B1 B2 P1 L1 6	Award B1 for each FT their points for P1 CAO Award P1, L1 for line drawn passing through the correct points
12(a) Square | Kite, Rhombus, Parallelogram (b) Square, Rhombus, Parallelogram | Kite	B2 B2 4	B1 for any 3 unambiguous correct entries B1 for any 3 unambiguous correct entries
13.(a) 3e + 2f (p) (b) $\frac{3e + 2f}{100}$ or 0.03e + 0.02f (p) or equivalent	B2 B1 3	Allow 3×e + 2×f B1 for either 3e (or 3×e or e×3) or 2f (or 2×f or f×2) If B2, penalise further incorrect work -1 Must clearly show ALL divided by 100. FT their (a) if a sum of 2 terms, equivalent difficulty
14(a) 120° drawn from Start 040° drawn from the position of the first clue 280° drawn from the position of the second clue Line 7.5cm OR 9cm OR 2.5cm for the appropriate stage Accurate chart with lengths and angles correct (b) 300° (c) Distance (±2mm) from the position of the third clue to the start Bearing (±2°) from the position of the third clue to the start	 B1 B1 B1 B1 B1 B1 B1 B1 8	Accept 'their North' provided ±2° from the North given. Penalise 'their North' outside of this tolerance once only ±2° ±2° ±2° ±2mm Within tolerances allowed ±2°. FT from their diagram FT from their diagram (Actual is approximately 10.5×40 = 420m) FT from their diagram (Actual is approximately 250°)
15(a) Reason, e.g. all different age groups (b) Two boxes if you are 20 or refers to 'wide' group of older people (c) Suitable question with at least 3 boxes, no overlap or gaps (in pence) and prices from a low value upwards considered (d) Reason implying 'no' showing understand that repeating an experiment can lead to different results (e)(i) Reason implying no, such as: 'all columns total 20', 'all 60 answered', 'all people selected red, black or silver' (ii) Strategy to use all data (for 60 people) 12/60 (= 1/5 = 0.2)	E1 E1 E2 E1 E1 S1 B1 8	Not marking choice 'yes' or 'no', marking understanding of cross-section of people asked. So could be, e.g. 'yes, as older people don't go to the cinema', or 'no, as all sorts of people go to the cinema'. Look for focus on age in response. Do not accept contradiction of choice yes or no with reason. Do not accept reference to age related ownership of MP3 Do not accept 'people not liking to give age', or 'lie about age', or 'not enough boxes' (as ambiguous) E1 for suitable question with at least 3 boxes, max of 1 overlap or 1 gap, must be suitable for amounts such as £19.99, i.e. pence considered as well as £s, OR E1 for prices from a low value upwards considered, minimum acceptable range ≈£30 to ≈£50 Accept 'no, as different people have different thoughts/amount to spend' Accept more complex answers. Do not accept reference to just 20 people Ignore incorrect cancelling of 12/60. B0 for 12 out of 60, or 12 in 60, but either of these responses gets S1

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UNIT 1 - HIGHER TIER

Applications Unit 1 Higher Tier January 2013		Final
1.(a)(i) $3e + 2f$ (p)	B2	Allow $3\times e + 2\times f$ B1 for either $3e$ (or $3\times e$ or $e\times 3$) or $2f$ (or $2\times f$ or $f\times 2$) If B2, penalise further incorrect work -1
(ii) $\frac{3e + 2f}{100}$ or $0.03e + 0.02f$ (p) or equivalent	B1	Must clearly show ALL divided by 100. FT their (i) if a sum of 2 terms, equivalent difficulty
(b) 1000t	B1	Allow $1000\times t$ or $t\times 1000$
(c) $5x$	B1	Allow $5\times x$ or $x\times 5$
(d) $14q^2$ (cm^2) or equivalent	B2 7	B1 for $\frac{1}{2} \times 4q \times 7q$ If B2, penalise further incorrect work -1
2(a) Square | Kite, Rhombus, Parallelogram	B2	B1 for any 3 unambiguous correct entries
(b) Square, Rhombus, Parallelogram | Kite	B2 4	B1 for any 3 unambiguous correct entries
3(a) 255 $51(578 + 5)$ OR $6y^3 + 15y$ = 29733 Abby's code AND 1083	B1 M1 A1 B1	CAO CAO CAO. Answer space not a contradiction. FT 1083 AND all their 4 digit codes selected If correct evaluation accept blank 'Abby's code ....' space
(b) 1369	B2 6	B1 for sight of 37
4(a) Reason, e.g. all different age groups	E1	Not marking choice 'yes' or 'no', marking understanding of cross-section of people asked. So could be, e.g. 'yes, as older people don't go to the cinema', or 'no, as all sorts of people go to the cinema'. Look for focus on age in response. Do not accept contradiction of choice yes or no with reason.
(b) Two boxes if you are 20 or refers to 'wide' group of older people	E1	Do not accept reference to age related ownership of MP3 Do not accept 'people not liking to give age', or 'lie about age', or 'not enough boxes' (as ambiguous)
(c) Suitable question with at least 3 boxes, no overlap or gaps (in pence) and prices from a low value upwards considered	E2	E1 for suitable question with at least 3 boxes, max of 1 overlap or 1 gap, must be suitable for amounts such as £19.99, i.e. pence considered as well as £s, OR E1 for prices from a low value upwards considered, minimum acceptable range ≈£30 to ≈£50
(d) Reason implying 'no' showing understand that repeating an experiment can lead to different results	E1	Accept 'no, as different people have different thoughts/amount to spend'
(e)(i) Reason implying no, such as: 'all columns total 20', 'all 60 answered', 'all people selected red, black or silver'	E1	Accept more complex answers. Do not accept reference to just 20 people
(ii) Strategy to use all data (for 60 people)	S1	
12/60 (= 1/5 = 0.2)	B1 8	Ignore incorrect cancelling of 12/60. B0 for 12 out of 60, or 12 in 60, but either of these responses gets S1
5(a)		Accept 'their North' provided ±2° from the North given. Penalise 'their North' outside of this tolerance once only
120° drawn from Start	B1	±2°
040° drawn from the position of the first clue	B1	±2°
280° drawn from the position of the second clue	B1	±2°
Line 7.5cm OR 9cm OR 2.5cm for the appropriate stage	B1	±2mm
Accurate chart with lengths and angles correct	B1	Within tolerances allowed
(b) 300°	B1	±2°. FT from their diagram
(c) Distance (±2mm) from the position of the third clue to the start	B1	FT from their diagram (Actual is approximately $10.5\times 40 = 420$m)
Bearing (±2°) from the position of the third clue to the start	B1 8	FT from their diagram (Actual is approximately 250°)
6. 195/3 (=65) × 10 (£)650	M1 m1 A1 3	OR sight of 130, (195,) and 325 OR sight of 130+195+325 CAO

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Applications Unit 1 Higher Tier January 2013		Final
7.(a)(i) Mid-points 52, 56, 60 and 64 52×12 + 56×32 + 60×14 + 64×2 (= 3384) /60 56.4 (ii) Strategy to look back that 32 out of 60 are size 2, e.g. '(table shows) about half customers are size 2 Conclusion to give Salesman is correct (b)(i) 242 235 229 (ii) Refers to 'smoothing out data', or 'giving a picture of a complete year's sales', or similar	B1 M1 M1 A1 M1 A1 B3 E1 10	 FT their mid-points including bounds FT their $\Sigma fx/60$ Accept 56 from correct working seen Accept reference back to (a)(i) table without specific numeral details provided 'salesman correct' stated. B2 for any two correct entries, B1 for a correct method seen, or 1 correct entry Do not accept 'makes it clearer' Accept 'averages data out'
8(a) Valid reason or explanation, e.g. 'pond fits inside a rectangle' or 'pond fits inside a rectangle' or 'approximates to a rectangle' Sight of 6×20 (b) E.g. Considers 2 semi-circles and a rectangle Method of calculating area Accuracy in establishing missing lengths / dimensions Improved estimate QWC1 for a clear explanation of 'their idea' with generally accurate spelling Look for • relevance • spelling • clarity of text explanations, • the use of notation (watch for the use '=' being appropriate) • units • labelling 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	S1 B1 S1 M1 M1 A1 QWC 2 <

Applications Unit 1 Higher Tier January 2013		Final
10(a) 40, 55, 60	B1	
(b) Correct cumulative frequency diagram, points plotted at bounds and joined by a curve or straight line	B2	FT from cumulative (i) . Allow initial plot at the origin. B1 for points correct but not joined, OR B1 correct apart from 0.5 translation, OR B1 if one error in plotting but joined correctly
(c) Median 17 (±0.5)	B1	FT from their cumulative diagram. Not cumulative no FT
Intention to subtract readings from horizontal axis for vertical 45 & 15	M1	FT from their cumulative diagram. *Watch for an answer of 12 from LQ rather than interquartile range, must be IQR is (24-12 =) 12 if working shown*
Interquartile range (12±1)	A1	
(d) General idea of what box – whisker should be	S1	
Range ends 37 and 2 correctly indicated	B1	
Median line correctly indicated	B1	FT their median
UQ and LQ correctly indicated	B1	FT their UQ and LQ readings
(e) Strategy: use of median as same number above and below	S1	
Interpretation: half free + half at £4	M1	
Conclusion based on appropriate working that no difference expected, i.e. compares with all at £2	A1	
	13	
11(a)(i) Idea: 6 × … = 12	S1	
Height of 16 to 22 group indicated as 2	B1	
Correct uniform scale shown	B1	3 correct values, no incorrect values is sufficient
(ii) Method of summing width × height	M1	Must include at least 3 correct products. FT from their histogram with a uniform scale (6×0.5 + 4×5 + 4×6 + 6×2)
59	A1	CAO
(iii) Finding middle worker, i.e. 30th value (or 29 ½ th)	S1	FT from their histogram with a uniform scale
Realising within 12 to 16 interval	M1	
7 (or 6.5) out of the 24 in the group	M1	
13(.17seconds) or 13(.08 seconds)	A1	Must FT from histogram or either no working or correct working Do not accept an answer of 13 without working
(b) Correct histogram on the graph paper provided	B3	B2 for suitable uniform scale to at least 9, having worked with frequency density with at least 3 bars of the histogram correct B1 for working with frequency density, at least 3 calculations correct, OR sight of a uniform scale to 9 (not a scale to 36)
(c) '40 and over' with a reason based on the shape of the histogram or the skew of the data	E1	Accept 'over 40s' with a suitable reason Accept 'over 40s, other median is 13 seconds where as median for these lies in 8 to 12 second group'
	13	
12(a) Correct evaluation of at least 3 coordinates	M1	t: 0 1 2 3 4 5 6 7 8 v: 0 7 12 15 16 15 12 7 0
Suitable axes with appropriate scale and labels	A1	t= 0 to 8 and v = 0 to 16 (or 20). Must FT at least 3 correct points
Plotting at least 7 correct points (allow 2 slips)	M2	FT for their axes if reasonable. M1 for plotting between 3 and 6 correct points
Joining all 9 points with a curve	A1	
(b) (t =) 4 (seconds)	B1	FT from their graph
(c) Strategy, e.g. to draw a tangent at t = 7	S1	Accept appropriate other methods, e.g. close calculations to 7
Use of difference v / difference t	M1	Must be differences, not readings from axes. Ignore signs
= …… m/s^2 or ms^{-2}	A1	Reasonable from their graph. Must be negative (e.g. -6)
	U1	Does not depend on previous marks
(d) Identifying the required area	S1	Maybe shown on their graph
Splitting area into areas that can be approximated	M1	
Complete calculation for the area required	M1	
Accurately calculated	A1	(Possible answers include 80 (metres) using 2 triangles and 2 trapezia, or 84 (metres) using 2 triangles and 6 trapezia, 85.33... (metres)
	14	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS
UNIT 1: APPLICATIONS 1
FOUNDATION TIER

A.M. WEDNESDAY, 13 June 2012

$1\frac{1}{2}$ 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 **6**.

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

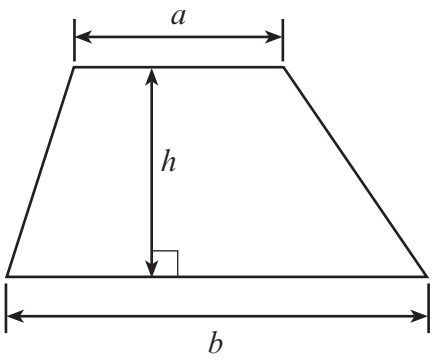
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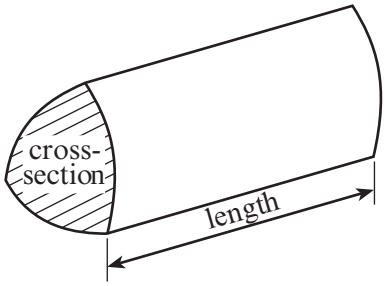
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Formula List

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



Volume of prism = area of cross-section × length



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1. Information about a sports car is given in the table below.



Engine size (cc)	Weight (kg)	Time from 0 mph to 60 mph (sec)	Top Speed (mph)	Price (£)
6498	1576	2·9	217	231 399

Express

(a) the weight of the sports car to the nearest 10 kg,

.....

[1]

(b) the engine size to the nearest 1000 cc,

.....

[1]

(c) the price to the nearest £10 000,

.....

[1]

(d) the time, from 0 mph to 60 mph, to the nearest second.

.....

[1]

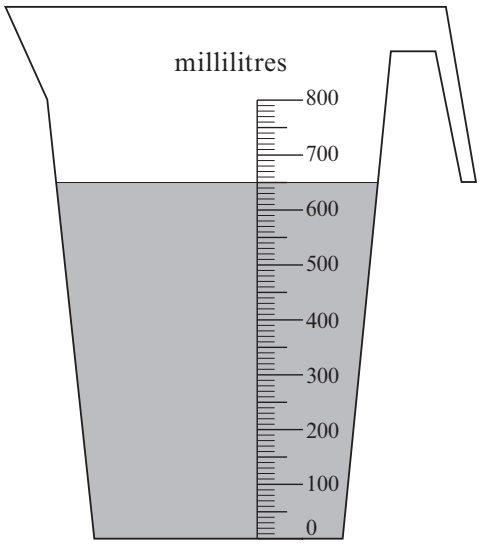
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2. *(a)* The following measuring instruments were used to prepare dinner in a kitchen.

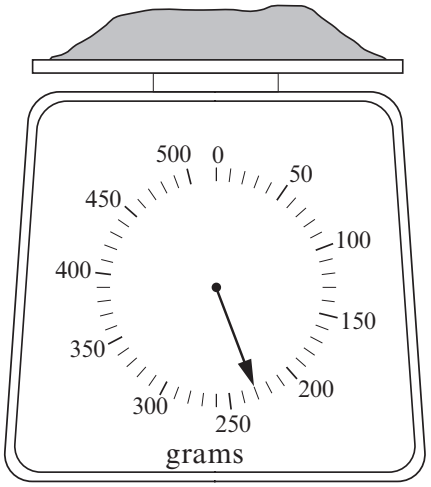
(i) What is the volume of the liquid in the jug?



[1]

Volume of liquid is ..... millilitres.

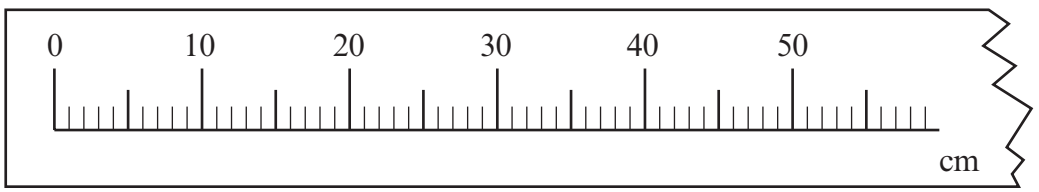
(ii) How much flour is being weighed?



[1]

The flour weighs ..... grams.

(iii) A baking tray of length 36 cm is needed.
Draw an arrow on the measuring tape to show this length. [1]



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(b) A birthday cake is made in the shape of a triangular sail on a boat.
The dimensions of the sail are 45 cm, 33 cm, and 24 cm.
Draw an accurate diagram of the sail, using a **scale of 1 cm to represent 3 cm**.

The line representing the 45 cm side has already been drawn for you.

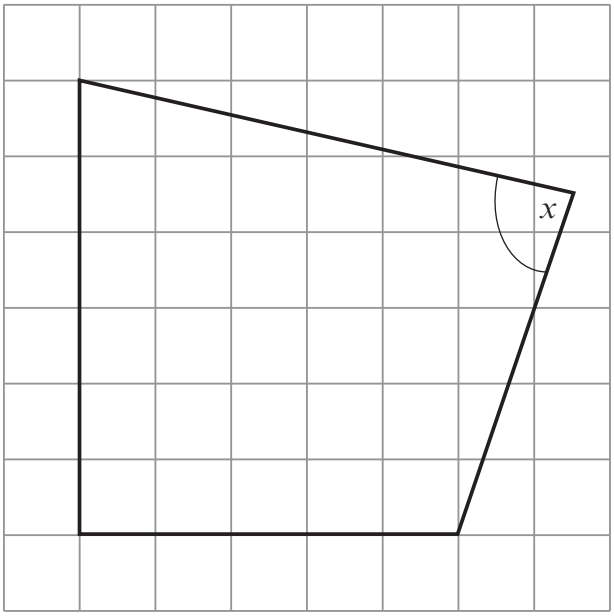
[3]

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3. A scale drawing of a bedroom floor is drawn on the centimetre square grid below.



(a) If 1 square cm represents 1 square metre, estimate the area of the bedroom floor.

.....

.....

Area = ... square metres.

[2]

(b) Measure the size of angle x.

.....

[1]

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(c) Circular pictures of planets are going to be placed on the walls of the bedroom.
A template needs to be drawn.
Make an accurate drawing of the circular template.
The radius of the template is 5·7 cm. [1]

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4.

The Perfect Pizza Company

Pizza	Thin base		Deep base	
	Small	Medium	Small	Medium
Margherita	£6.79	£8.49	£7.79	£9.49
Pepperoni	£7.39	£9.69	£8.39	£10.69
Chicken Feast	£7.49	£9.79	£8.49	£10.79
Veggie Supreme	£7.29	£9.29	£8.29	£10.29
Hot & Spicy Meat Feast	£8.49	£9.99	£9.99	£11.99

Stuffed crust pizza - £1.50 more than deep base option.

Delivery charge of £2.50 added to the total cost of the order.

Paul and his friends order some pizzas to be delivered.
They order

a small deep base Veggie Supreme,

a medium Chicken Feast stuffed crust

and two medium thin base Hot & Spicy Meat Feasts.

(a) Calculate the total cost of the order including the delivery charge.

.....

.....

.....

.....

.....

.....

.....

.....

[5]

(b) Paul only has £10 notes.
How many £10 notes will be needed to pay the delivery man?

.....

.....

.....

.....

[1]

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5. *(a)* An approximate relationship between your height, measured in cm, and the length of your forearm, measured in cm, is given by the formula:

Height = 4·3 x length of forearm + 62

(i) A child's forearm is 10 cm long. Use the formula to find the child's height.

.....

.....

.....

[2]

(ii) An adult's height is 191 cm. Use the formula to calculate the length of the adult's forearm.

.....

.....

.....

[2]

(b) Simone is asked to add $3\frac{1}{10}$ and $4\frac{8}{9}$.

She **estimates** the answer to the nearest whole number.
Explain how Simone may have found her **estimate** and write down what this **estimate** would be.

.....

.....

.....

.....

.....

.....

[2]

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

A bricklayer builds a garden wall using 1500 bricks.



- Bricks cost £0.72 each.
- The bricklayer charges £200 for every 500 bricks he lays.
- 1·5 tons of sand are used at £42 per ton.
- 16 bags of cement are used at £4.90 per bag.

What is the total cost of building the wall?

.....

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[9]

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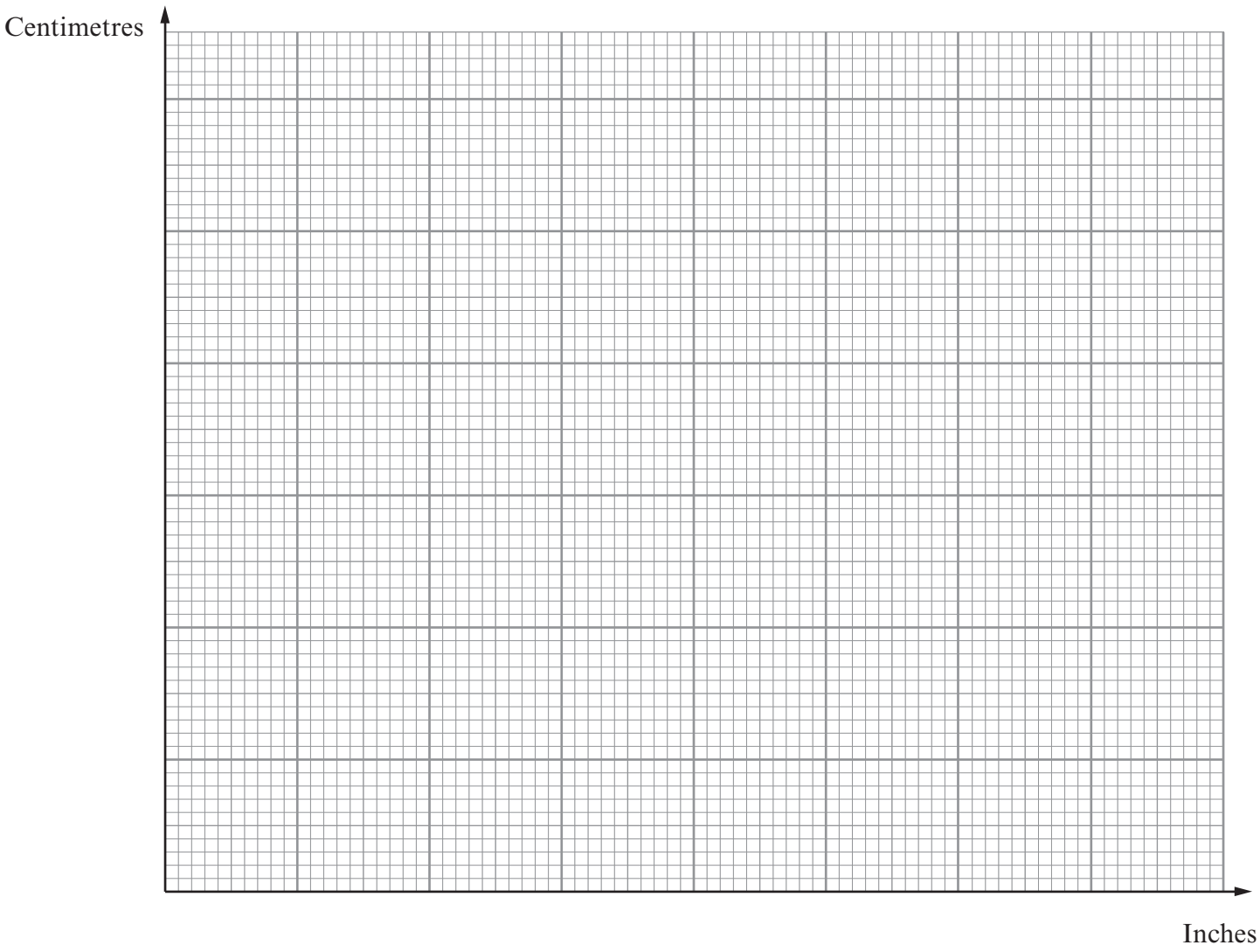
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7. A dressmaker uses the following information to convert between inches and centimetres.

Inches	2	7	12
Centimetres	5	17·5	30

(a) Use this information to draw a conversion graph for inches and centimetres on the graph paper below. [4]



(b) The length of a sleeve on a dress is 9 inches.
How many centimetres is this?

.....

[1]

(c) A dressmaker has a skirt of length 70 centimetres.
Find the length of the skirt in inches.
Explain how you obtained your answer.

.....

.....

.....

.....

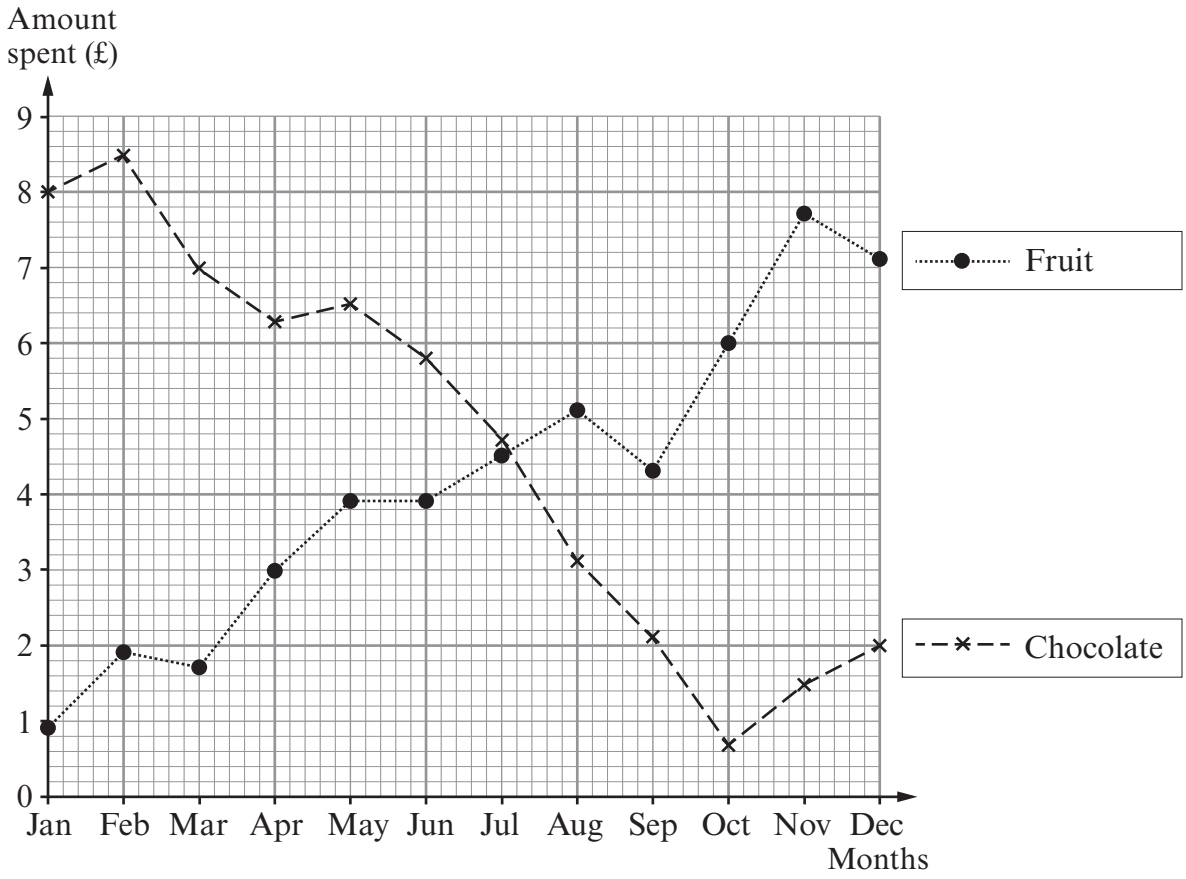
[2]

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8. The graph shows the amount that a teenager spent each month on chocolate and fruit during 2011.



(a) How much did the teenager spend on fruit in April?

.....

.....

[1]

(b) Describe the trend in the amount the teenager spent on fruit and the trend in the amount the teenager spent on chocolate.

.....

.....

.....

.....

.....

.....

[2]

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9.



The number of pairs of shoes sold by Mrs Thomas on different days were

49 43 58 42 67 74 78 40 60 89.

Mr Richards sold 402 pairs of shoes in total over a period of 7 different days.
On average, who had the greater daily sales?
Show all your working.

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[5]

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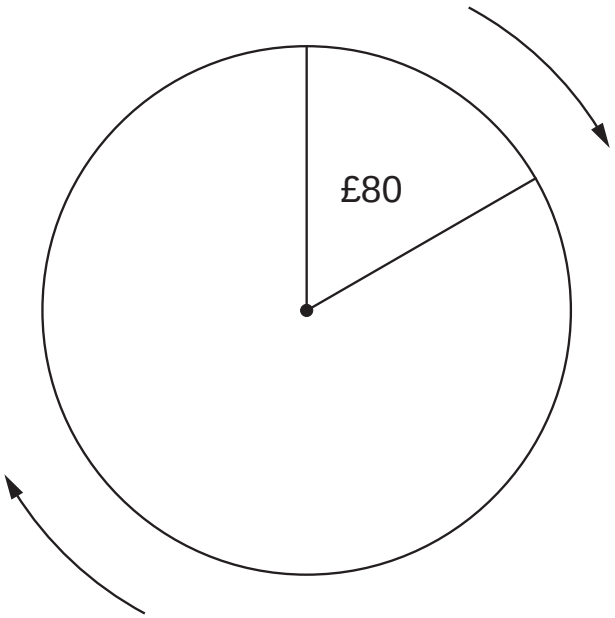
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Turn over.

Examiner only

10. A prize wheel for a television game show is made from a large circular piece of wood.
The prize wheel is divided into six equal parts.
The parts are labelled £80, £50, £200, £0, £500 and £4000.

(a) Complete the drawing of the prize wheel. The £80 part has been drawn for you. [2]



(b) Each time the prize wheel is spun, it stops on one part.

(i) What is the probability that £4000 is won on the first spin?

.....

.....

[1]

(ii) What is the probability that £4000 is won on the second spin?

.....

.....

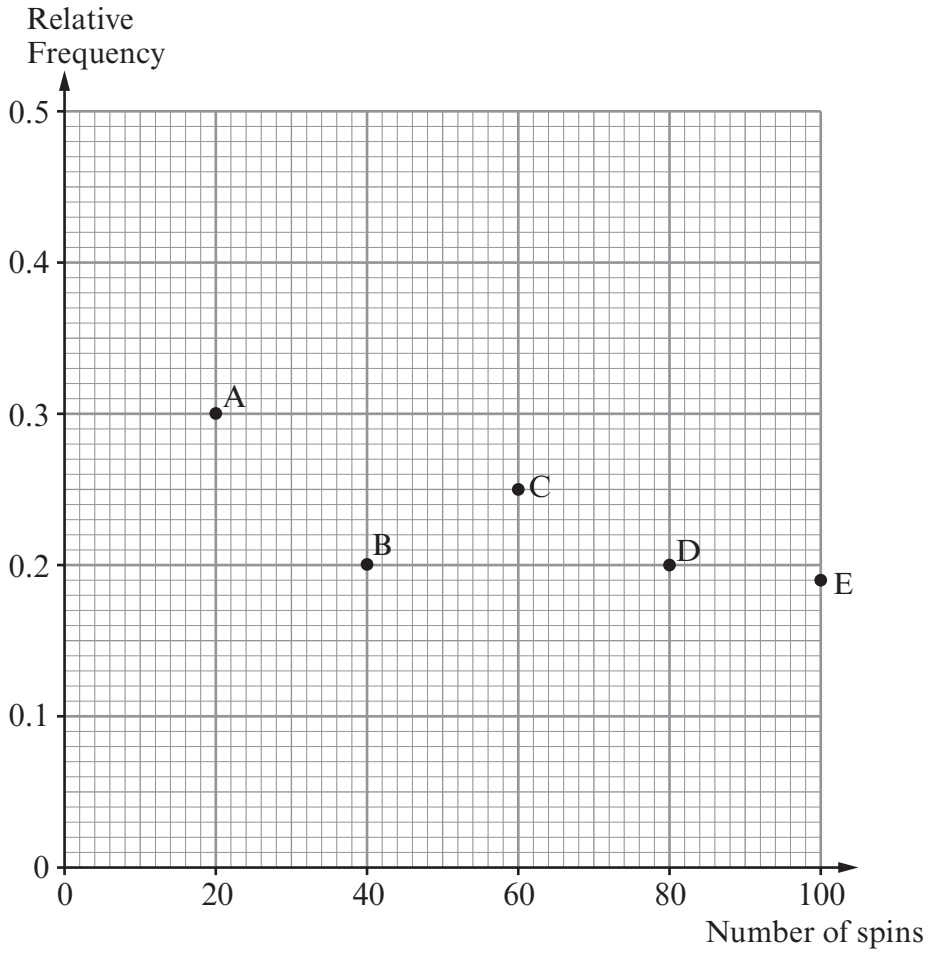
[1]

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(c) The relative frequency of winning £4000 was calculated after a total of 20 spins, 40 spins, 60 spins, 80 spins and 100 spins. The results were plotted on the graph below.



Which of the readings, noted by the letters A, B, C, D and E on the graph, is likely to give the best estimate of the probability of winning £4000 when the prize wheel is spun? You must give a reason for your answer.

.....

.....

.....

.....

.....

[2]

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11. Bethan has x pounds.
Rhys has 5 pounds more than Bethan.
Kieran has three times as much as Rhys.
Write an expression, in terms of x, for the total amount in pounds, that Bethan, Rhys and Kieran have altogether. Give your answer in its simplest form.

.....

.....

.....

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.....

.....

Total amount = ... pounds

[4]

12. Mrs. Denis has a circular dining table with a diameter of 1·5 metres.

(a) What is the area of the top surface of the table?

.....

.....

.....

.....

[2]

(b) Mrs. Denis needs to put an edging strip around the table.
What is the circumference of the table?

.....

.....

.....

.....

[2]

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13. A chart is kept to show the position of a yacht at three times during the day.
These are the notes that have been kept in order to plot the positions of the yacht on the chart.

Notes:

- Start time was 12 noon
- At 13:00 its position was 6 nautical miles on a bearing of 134° from the start
- At 14:00 its position was 4 nautical miles on a bearing of 200° from its position at 13:00

(a) Use a scale of **1 cm to represent 1 nautical mile** to complete the chart.

[3]



(b) Write down the bearing of the yacht and its distance from the start position at 14:00.

.....

Bearing .....°

Distance ..... nautical miles

[2]

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Turn over.

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14. You are asked to check Damian's homework.
He has answered 8 questions.
The homework questions and Damian's answers are given in the table below.

Question number	Question	Damian's answer
1	Calculate $48 + 62$	100
2	Simplify $7y + y - 3y$	$4y$
3	Simplify $3a - 5b + 26a - 26b$	$29a + 31b$
4	Expand $6(x + 2)$	$6x + 12$
5	Simplify $3(2x + 5) - (x - 3)$	$5x + 12$
6	Factorise $24x + 8$	$8(3x + 0)$
7	Factorise $3x + 15$	$3(x + 5)$
8	Find the value of $2a - 3b$ when $a = 6$ and $b = -4$	0

Complete the table below to indicate if Damian's answers are correct or not.
If any of his answers are incorrect, you must give the correct answer.

Question number	Correct? Yes or No	If no, give the correct answer
1	No	110
2		
3		
4		
5		
6		
7		
8		

Extra working space

.....

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.....

[6]

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15. A fishing competition is to be held out at sea in a rectangular area that is 5 km by 4 km and marked out by buoys. Safety boats are positioned at two different corners of the rectangular area marked out by the buoys.
Each safety boat patrols an area not exceeding 3 km from its initial position.

Consider the options for positioning the two safety boats.
Decide which of your options is best for positioning the two safety boats.
You must clearly show and explain why your solution is the best option.

Explanation:

.....

.....

.....

.....

.....

.....

.....

[5]

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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 1 (FOUNDATION TIER)

Applications Unit 1 Foundation June 2012		FINAL
1. (a) 1580 (kg) (b) 6000 (cc) (c) (£) 230000 (d) 3 (seconds)	B1 B1 B1 B1 4	 Accept 3.0
2.(a) (i)650 (ii) 230 (iii) Arrow at 36cm (b) Correct use of scale 2 correct sides of the completed triangle	B1 B1 B1 B1 B2 6	 Must be unambiguous Sight of 45 ÷ 3 (=15), 33 ÷ 3 (=11) or 24 ÷ 3(=8) is evidence of use of scale OR 11 or 8 drawn Award B1 for 1 correct side of triangle OR for 2 correct lengths that do not create a triangle. *Use overlay*
3. (a) Attempt to count area Estimate of area within range 25 – 32 m^2 (b) 84(°) (c) circle of radius 5.7 cm	M1 A1 B1 B1 4	 ± 2° ± 2 mm
4. (a) (£)8.29 + (£)10.79 + (£)1.50 (=12.29) + 2 × (£)9.99 (=19.98) +(£)2.50 =(£)43.06 (b) Need 5 £10 notes	B1 B1 B1 B1 B1 B1 6	*When £2.50 added to each part of the order mark as a misread* *Award B4 for answer of (£)40.56* FT their 2 × 9.99 and/or their 10.79 + 1.50 FT their 43.06. Accept embedded answers.
5. (a)(i) 4.3 × 10 + 62 = 105 (cm) (ii) (191 – 62) ÷ 4.3 = 30 (cm) (b) (Estimate of) 8 Full explanation	M1 A1 M1 A1 B1 E1 6	Attempt to multiply **and** add correctly Attempt to subtract **and** then divide Eg. "Because 1/10 and 8/9 is nearly a whole one and 3 + 4 = 7, so 8 in total." 3 + 5 = 8 gets B1 E1 Only 8 gets B1 E0. An exact answer (7 89/90 or 7.988..) only gets B0 E0, however, if they then round to 8 award B1, E0

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Applications Unit 1 Foundation June 2012		FINAL
6. (cost of bricks =)1500 × (£)0.72 = (£)1080 (Charge for laying)(1500 ÷ 500) × (£)200 =(£)600 (Cost of sand=)(1.5 × 42 =) (£) 63 (Cost of cement=) (16 × 4.90 =) (£)78.4(0) (Total cost of the wall=) (£)1821.4(0) <u>Notes:</u> QWC2 can only be awarded if the correct unit is shown in the final answer and the zero is included in the final answer. QWC2 requires words throughout the response not just connected to the final answer. Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£' and '0' appropriately used) 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 B1 B1 B1 Q W C 2 9	FT their (£)1080, (£)600, (£)63 **AND** (£)78.4(0) 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.
7. (a) Uniform scale used for inches Uniform scale used for cm Plotting all points correctly **Correct** straight line (b) Approximately 22.5. Accept answer in range 22 – 23 (c) Full explanation given Approximately 28 inches	B1 B1 P1 L1 B1 E1 B1 7	*If reversed axes and labelled award marks. But if reversed axes and not labelled penalise -1* L0 for curve or "dog-leg" FT their straight line graph Eg use of graph or arithmetic method FT their graph
8. (a) amount spent on fruit (£)3 (b) Full description given on the trend in the amount spent on chocolate **and** the trend in the amount spent on fruit.	B1 E2 3	Award E1 for partial description OR for description for either fruit **or** chocolate.
9. Mean for Mrs Thomas = 600 ÷ 10 = 60 Mean for Mr Richards (402 ÷ 7 =) 57.(42857143) Mrs Thomas	M1 m1 A1 B1 B1 5	Attempt to add all given values for Mrs Thomas Award B1 if 60 × 7 = 420 used to compare with 402 Only award final B1 if an attempt has been made to calculate **both** means – has been awarded M1 & B1 FT their means

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Applications Unit 1 Foundation June 2012		FINAL
10. (a) All sectors correct and labelled	B2	Award B1 for 1 sector correct and labelled OR for all sectors correct but not labelled (±2°) *Use overlay*
(b)(i) 1/6	B1	*Penalise -1 once only for wrong notation used in (b)*
(ii) 1/6 or equivalent	B1	FT their (i) Do not accept 2/12 if shown 1/6 + 1/6 = 2/12
(c) E	B1	Accept 0.19 or 100 spins
Reason given eg More spins leads to a reliable probability	E1	Accept "it's closest value to 1/6"
	6	
11. 5x + 20 or equivalent	B4	Award B3 for 3(x + 5) or 3x + 15 Award B2 for 3 × x + 5 or x + 5 × 3 Award B1 for x + 5
	4	
12.(a) $\pi \times 0.75^2$	M1	
$= 1.7(67145868)$ (m^2)	A1	Allow answers between 1.7 and 1.8 inclusive
(b) $\pi \times 1.5$	M1	
$= 4.7(1238898)$ (m)	A1	
	4	
13.(a) 134° drawn from Start	M1	±2° *Use Overlay*
200° drawn from their first position	M1	±2°
Accurate chart with lengths (±2mm) and angles correct	A1	Within tolerance allowed FT to (b) for any 2-part journey, except for responses related to given information, e.g. leading to responses 200° and 4 nautical miles. Any bearing given in (b) must be 3 figures
(b) Bearing (±2°) from start to **their** 2nd position	B1	Approximately 160°
Distance (±2mm) from start to **their** 2nd position	B1	Approximately 8.5 nautical miles
	5	
14.	B6	Table correct B1 for Q4 **and** Q7 **both** 'Yes' B1 for each correct corrected answer
	6	
15.		*May all be completed by reasonable sketches*
Strategy, e.g. sketching an appropriate rectangle, (e.g. 5 cm by 4 cm)	S1	Intention, accuracy not demanded
Placing both boats at corners	S1	
Indicating one ¼ circle area inside the rectangle	B1	Intention, no need for accuracy Ignore extra ¾ outside the rectangle
Showing or stating boats at diagonally opposite corners, with 2 × ¼ circle areas either included in sketches or stated	B1	Ignore extra ¾ outside the rectangle
Conclusion diagonally opposite corners and based on not wanting overlapping areas	E1	Depends on previous B1. Needs to be stated or annotated on a diagram, e.g. 'look no overlaps' Accept 'covers more area' only if justified by clear diagrams (need to show a minimum of least one other situation the best solution)
	5	

Q	Y/N	Correct answer
1	Given	Given
2	No	5y
3	No	29a – 31b
4	Yes	
5	No	5x + 18
6	No	8(3x +1)
7	Yes	
8	No	24

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UNIT 1 (HIGHER TIER)

<table>
<tr><th>Applications Unit 1 Summer 2012</th><th></th><th>FINAL</th></tr>
<tr><td>1.(a) a = 62
b = 73
c = 62
d = 136
(b) All three angles given: 134(°), 46(°), 134(°),</td><td>B1
B1
B1
B1
B2
6</td><td>
FT 135 - a
FT a or 135 - b
FT 74 + c
B1 for sight of 134, or for the full process shown but 1 error in the calculation</td></tr>
<tr><td>2.(a) Realises that measurement could have been rounded down to 6 cm (may also give an example), e.g. ‘each box could be at upper bound, so height could be a much as 13 cm’

(b) 4a+4b+4c (cm) or 4(a+b+c) (cm)</td><td>E2

B2

4</td><td>For E2 both of the boxes should be mentioned
E1 for an example without an explanation, or statement such as ‘could be over 6cm’ or similar without mention of rounding down

If B2 penalise further incorrect working -1
B1 for correct expression but not in simplified form, or na + nb + nc where n is a whole number but n≠1 or n≠0
If B2, mark final answer, do not ignore further incorrect work</td></tr>
<tr><td>3 (1,1) (1,2) (1,4) (1,8) (1,16)
(3,1) (3,2) (3,4) (3,8) (3,16)
(9,1) (9,2) (9,4) (9,8) (9,16)</td><td>B3

3</td><td>With no incorrect dots (3,4) was given
B2 for any 8 to 13 correct with no more than 1 or 2 incorrect plots
B1 for any 5 to 7 correct with no more than 3 incorrect
SC1 for all 14 reversed, or sight of all factors of 9 and 16</td></tr>
<tr><td>4.
<table><tr><td>Q</td><td>Y/N</td><td>Correct answer</td></tr><tr><td>1</td><td>Given</td><td>Given</td></tr><tr><td>2</td><td>No</td><td>29a – 31b</td></tr><tr><td>3</td><td>Yes</td><td></td></tr><tr><td>4</td><td>No</td><td>5x + 18</td></tr><tr><td>5</td><td>No</td><td>8(3x +1)</td></tr><tr><td>6</td><td>Yes</td><td></td></tr><tr><td>7</td><td>No</td><td>24</td></tr></table></td><td>B5

5</td><td>Table correct

B1 for Q3 and Q6 both ‘Yes’
B1 for each correct corrected answer</td></tr>
<tr><td>5.(a) 134° drawn from Start
200° drawn from their first position
Accurate chart with lengths (±2mm) and angles correct

(b) Bearing (±2°) from start to their 2nd position
Distance (±2mm) from start to their 2nd position</td><td>M1
M1
A1

B1
B1
5</td><td>±2°
±2°
Within tolerance allowed
FT to (b) for any 2-part journey, except for responses related to given information, e.g. leading to responses 200° and 4 nautical miles.
Any bearing given in (b) must be 3 figures
Approximately 160°
Approximately 8.5 nautical miles</td></tr>
</table>

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Applications Unit 1 Summer 2012		FINAL
6.(a)(i) **Vertical** plots accurate for at least 5 years Horizontal & vertical plots accurate for at least 5 years All points accurately plotted	P1 P1 P1	 Ignore any joining of points
(ii) Appropriate method, e.g. considering an appropriate point on their graph (perhaps approximately ½ way) between 2008 and 2009 plots, or (248 + 300)/2	M1	FT their graph, taking forward the idea of joining points with a straight line or a curve
Answers in the range 254 to 294	A1	
(b) Sight of (640,) 320, 160, (80, …) Realising equal numbers during **2006** Method to establish the quarter, e.g. plotting ordinary light bulb numbers on low energy graph and look for intersection, or comparing 172, 178.5, 185, 191.5, 198 with 320, 280, 240, 200, 160, or arithmetic method, or method based on a curve	M1 A1 m1	FT from their graph drawn in (a) Do not accept a comparison with a 'line of best fit' given in (a)
4th (quarter) 2006	A1	Accept October, November or December 2006 Do not FT from a 'line of best fit' given in (a) *SC3 for unsupported answer 4th quarter of 2006* *SC2 if error in division by 2 of 640, but FT appropriate method and accuracy* *SC1 for conclusion 'January 2007', also possible M1 and if stated 'equal number during 2006' A1, but m0 or final A0. This does <u>not</u> apply to conclusion '1st quarter 2007'*
	9	
7(a) Idea of scale is match of units, 1cm=25 000 cm	S1	Or equivalent initial idea
80 × 25000	M1	Accept sight of 80 × 25000 with a place value error in the 25000
= 2 000 000 (cm)	A1	Maybe embedded with change of units (20 000m) If units are given they must be correct The unit 'cm' also implies previous S1
1km = 100 000cm	B1	Or 1m = 100cm with 1000m = 1km
20 (km)	A1	If units are given they must be correct
(b) 80 cm is 20 km OR 4 cm is 1 km OR equivalent	B1	FT their 20km from (a) leading to 24 × 80/(a)
24 × 4 or equivalent	M1	
96 (cm)	A1	If units are given they must correct *Alternative: 24 (km) ÷25 000* *Unit conversion (× 100 000)* *96 (cm)* *If units are given they must correct*
(c) 24/6 Cycled 20 (km) AND Pushed bike uphill 4 (km)	M1 A1	Answers reversed allow M1
24/12 Cycled 22 (km) AND Pushed bike uphill 2 (km)	M1 A1	Answers reversed allow M1 *If no marks in (c) then SC1 for all answers in correct ratio but not with a total of 24, but not the answers 5 and 1 or 11and 1*
	12	

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Applications Unit 1 Summer 2012		FINAL
8. Strategy, e.g. sketching an appropriate rectangle, (e.g. 5 cm by 4 cm) Placing both boats at corners Indicating one ¼ circle area inside the rectangle Showing or stating boats at diagonally opposite corners, with 2 × ¼ circle areas either included in sketches or stated Conclusion diagonally opposite corners and based on not wanting overlapping areas Look for • relevance • spelling • clarity of text explanations • diagrams or sketches 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	 S1 S1 B1 B1 E1 Q W C 2 <

Applications Unit 1 Summer 2012		FINAL
10. 7.2	B4 <

Applications Unit 1 Summer 2012		FINAL
15. Strategy, e.g. noticing 0 to 40 is 1.5 times 40 to 50, or first rectangle 3/5 with second 2/5 of a quantity	S1	or £25 with 20 people, or 40 squares for £50 may be seen on the histogram, or 30 written adjacent to 20
$40\times3x + 10\times8x = 40$ or equivalent, or 24 written adjacent to 16,	B1	Award of this B1 implies the award of the S1 also
Uniform scale 0.2, 0.4, 0.6, …, implied or shown (height of first rectangle is 0.6, 2nd height is 1.6, etc.)	B1	or sight of 0.2, or 'each person is 1 square', or sight of any 6 of 24, 16, 18, 22, 24, 18, 2 Award of this B1 implies the award of the S1 and previous B1 also *If M1 or M2 awarded, this implies previous S1, B1 and B1*
20×24+45×16+55×18+65×22+75×24+85×18+95×2 (or with the first term split 12×10+12×30) OR 0.6×20×40 + 1.6×45×10 + 1.8×55×10 + 2.2×65×10 + 2.4×75×10 + 1.8×85×10 + 0.2×95×10	M2	M1 for • any 3 correct products within the overall sum, or • the appropriate sum of products but with bounds used instead of mid points, or • use of mid points 55, 65, 75, 85 and 95 within a product sum
(£)7140	A1 6	CAO

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS
UNIT 1: APPLICATIONS 1
FOUNDATION TIER

A.M. MONDAY, 16 January 2012

1 ½ 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 **2**.

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

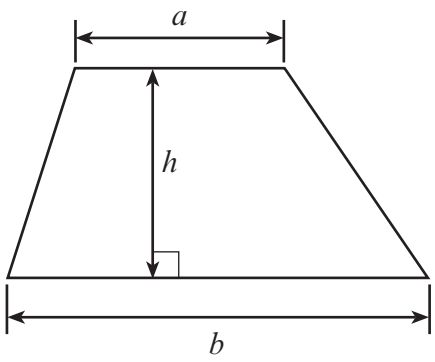
4361 010001

VP*(W12-4361-01)

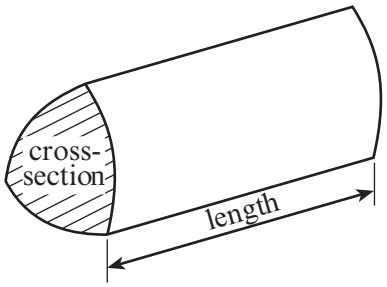
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Formula List

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



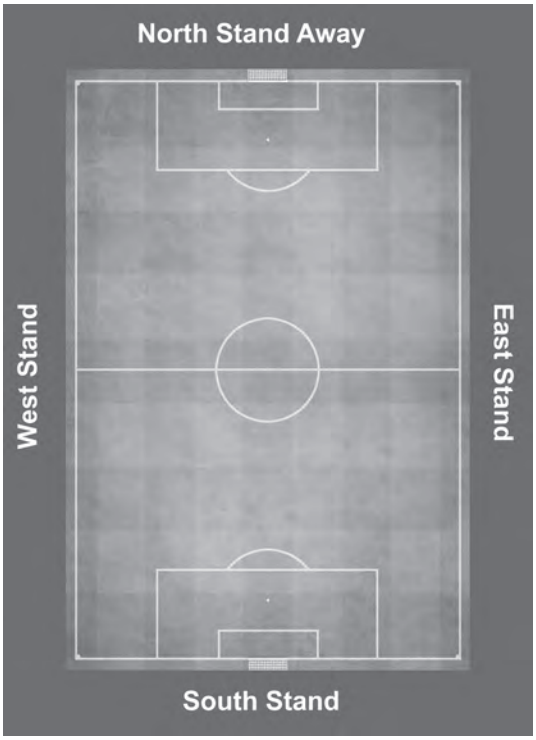
Volume of prism = area of cross-section × length



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1. The diagram shows the ground layout of a football stadium.



During a recent league game the number of spectators in the

West Stand was **7319**
East Stand was **6327**
South Stand was **4978**.

The North Stand is kept for away team supporters.
All **1093** away supporters were in the North Stand.

Showing **all** your workings, calculate the total attendance, rounding your answer to the nearest 100.

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[3]

4361 010003

Turn over.

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

Glyn was given £78 for Christmas from his family. He had also saved £41 throughout the year.

He spends some of his money in the January sales.
He buys a game for his computer and a pair of jeans.



Computer game
£14.99



Jeans
£58.49

Glyn also wants to buy a ticket to see his favourite rock band.
The ticket costs £65.
Can Glyn afford to buy the ticket? You must give a reason for your answer.

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[6]

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Examiner only

3. Jeremy and Susie visit a local car racing track.
They see three cars being driven on the track.
Each car needs to stop at some stage to refuel.



Before stopping to refuel,

the 1st car travels a distance of 192 kilometres at an average speed of 160 kilometres per hour,

the 2nd car travels a distance of 120 kilometres at an average speed of 150 kilometres per hour,

the 3rd car travels a distance of 110 kilometres at an average speed of 125 kilometres per hour.

Using the formula,

Time = Distance ÷ Average Speed

find which car travelled for the shortest length of time before having to stop to refuel.

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[3]

4361 010005

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Examiner only

4. Leah has received many detentions in school for not completing her homework.
The reason why she is receiving detentions is because she spends too much time playing games on her games console.
She decides to investigate the amount of time she spends playing games.
She records the number of minutes that she spends each day playing games.
The following are her results.

Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Minutes	68	80	30	68	120	240	185

(a) On which day did Leah spend exactly half an hour playing on her games console?

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[1]

(b) Find the mean, median, mode and range of the number of minutes spent per day playing games on her games console.

Mean

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Median

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Mode

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Range

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[7]

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Examiner only

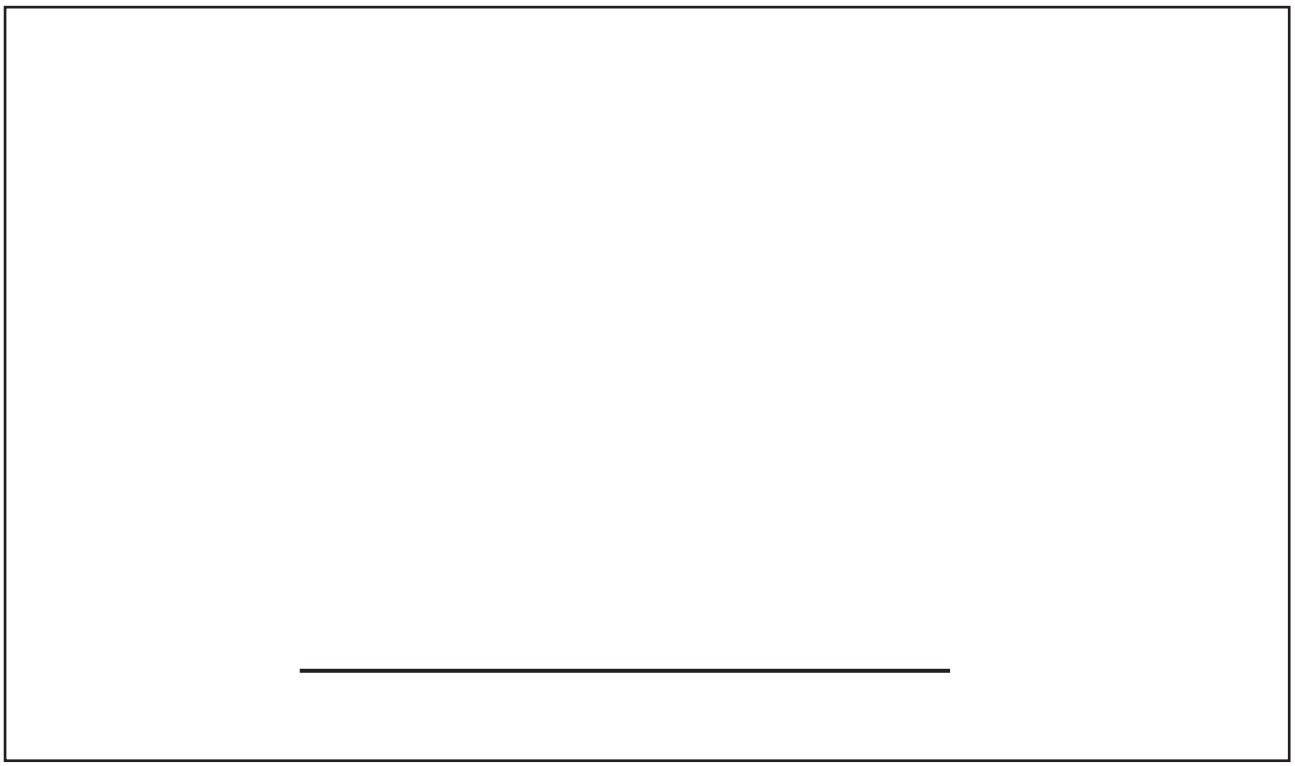
5. *(a)* Accurately draw the outline of a circular place mat for a coffee cup.
The place mat has a diameter of 9 cm. [2]

Turn over.

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Examiner only

(b) A triangular piece of material needs to be cut out of a rectangular piece of cloth. The line shown is the base of the triangle that needs to be cut out.



(i) How long is the base of the triangle?

.....

[1]

(ii) The line joining the top of the triangle to the midpoint of the base is perpendicular to the base and is 5·7 cm long.

Mark the position of the top of the triangle on the diagram shown above. [3]

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Examiner only

(c) A local business decides to build a new office.
A sketch of the floor of the building is shown below.

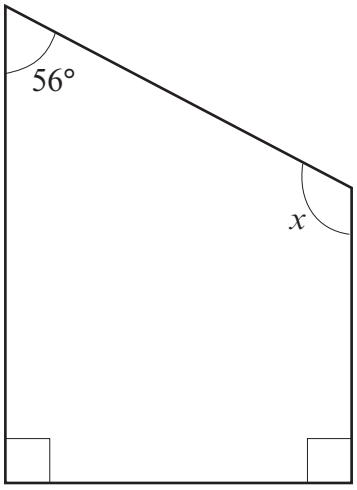


Diagram not drawn to scale

What is the size of the angle marked x?

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[2]

4361 010009

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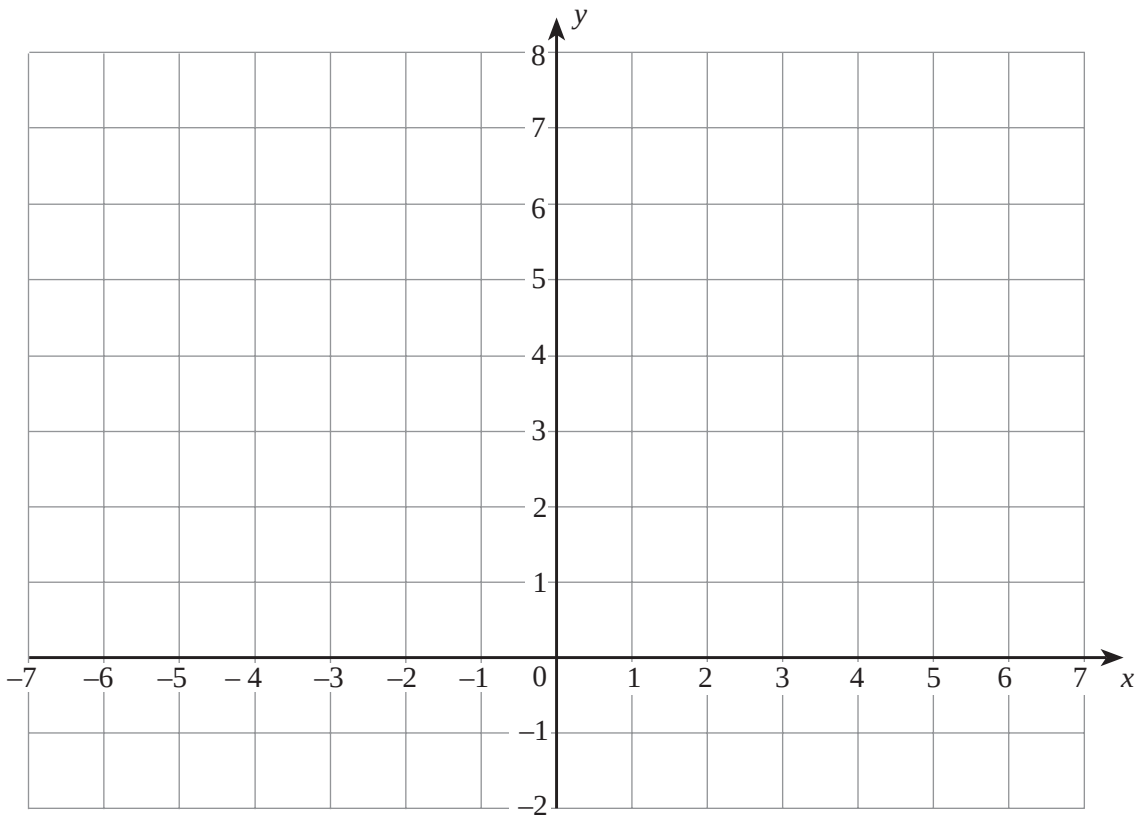
Examiner only

6. *(a)* Jane decides to enter a competition held by her school.

The rules of the competition are as follows:

- Plot 4 points on the centimetre-squared grid below to create a rectangle.
- The rectangle must overlap the y-axis.
- The rectangle must have an area which is greater than 31 cm^2.

Mark a possible position of Jane's rectangle on the grid and write down the coordinates of the 4 vertices (corners) of the rectangle.



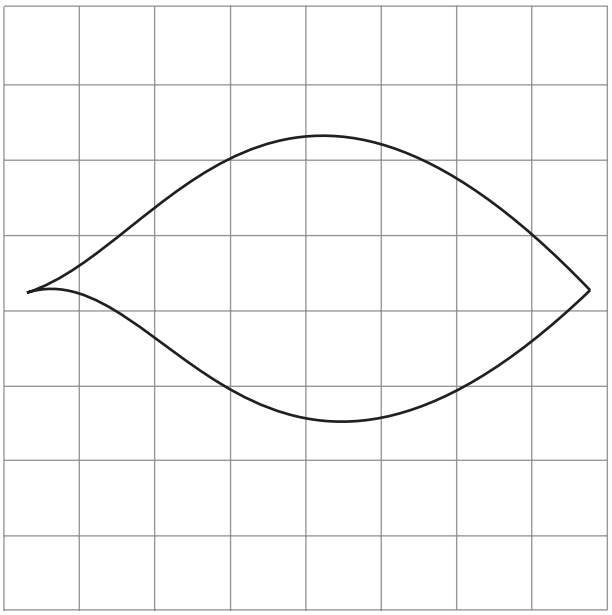
The 4 vertices (corners) have coordinates

(..... , ...) (..... , ...) (..... , ...) (..... , ...). [5]

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(b) Estimate the area of the leaf shown on the centimetre squared grid.



.....

.....

Estimate for the area of the leaf = ... cm^2 [2]

4361 010011

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7. Chloe decided to collect information about what type of footwear her friends like the most. The information she collected is shown below.

Type of Footwear	Number of people
Boots	11
Flip-flops	4
Pumps	5
Slippers	12
Trainers	8

(a) From the information that Chloe collected, what is the modal type of footwear?

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[1]

(b) If one of the people that Chloe asked was selected at random, what is the probability that they liked flip-flops the most?

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[1]

(c) If Chloe asks ten more people what type of footwear they like the most, do you think that the probability of liking flip-flops the most will be the same answer as you give in question *(b)*? You must give a reason for your answer.

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[1]

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Examiner only

8.

Marine Bay
Camping & Caravan Park





Pitch fees per night.
Tent = £12
Caravan = £16
Motor-home = £15

The Jones family invited their friends, the Williams and the Phillips families, to stay at the Marine Bay Camping and Caravan Park.

The Jones family have a caravan and stayed for 3 nights.
The Williams family have a motor-home and only stayed for one night.
The Phillips family stayed in a tent.

The total fee for the 3 pitches was £99.

For how many nights did the Phillips family stay?

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[4]

Turn over.

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Examiner only

9. Sami is taking his son and fourteen of his classmates to the cinema for his son's tenth birthday.
The price of one ticket is £4.70 for a child and £6.20 for an adult.
The cinema has a special offer if you book online.



4 tickets for the price of 3!
Cheapest ticket free

The offer is 4 tickets for the price of 3. The cheapest ticket is free.

Sami uses this offer when he books and pays for the tickets online.
How much does Sami pay for the 16 cinema tickets?

[4]

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Examiner only

10. *(a)* Find the value of $\dfrac{76{\cdot}5^3}{49{\cdot}84 - 5{\cdot}6}$ giving your answer correct to two decimal places.

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[2]

(b) Write down the above answer correct to one significant figure.

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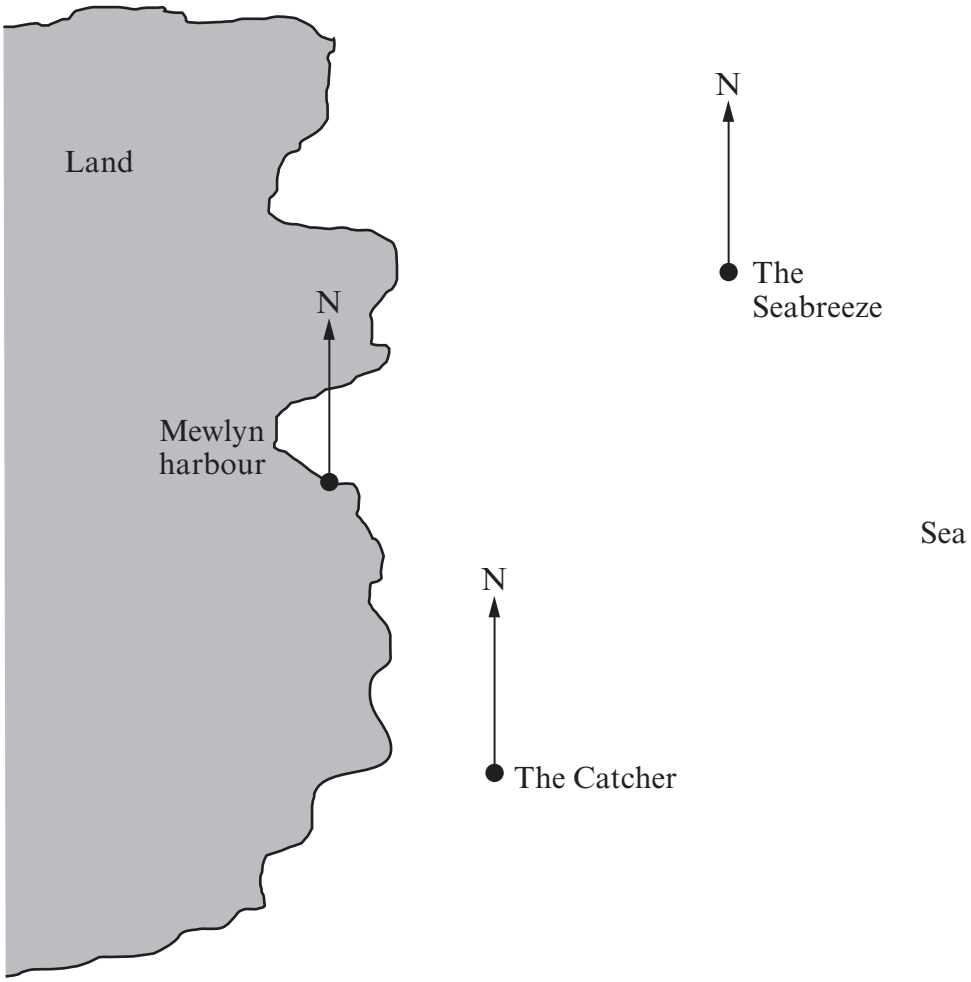
[1]

Turn over.

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Examiner only

11. Two fishing trawlers, The Seabreeze and The Catcher, are working out at sea.
The harbour that they take their catch to is Mewlyn harbour.
The map below shows the position of the fishing trawlers and the harbour.



(a) The Harbour Master needs to know the bearings of both fishing trawlers from Mewlyn harbour.
Complete the table below.

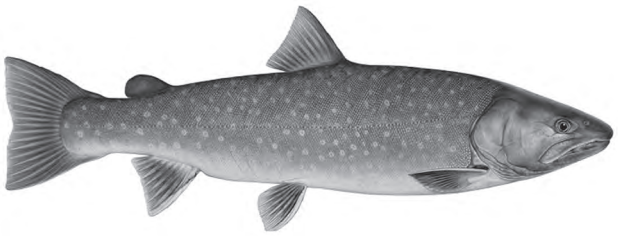
The bearing of The Seabreeze from Mewlyn harbour	
The bearing of The Catcher from Mewlyn harbour	

[2]

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(b) Due to a storm both fishing trawlers are unable to dock at Mewlyn harbour.
Both fishing trawlers can dock at a harbour which is on a bearing of 220° from The Seabreeze and 300° from The Catcher.
Mark the position of this harbour on the given map on the opposite page. [3]

(c) A fisherman on The Catcher takes a photograph of one of the fish caught.



The scale of the photograph is 1:5.

What is the actual length of the fish?
Give the units of your answer.

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[4]

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Examiner only

12. Write down expressions for each of the following.

(a) The total cost of 10 pencils at g pence each and 5 pens at h pence each.

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[2]

(b) The perimeter of a rectangle with length l cm and width w cm.

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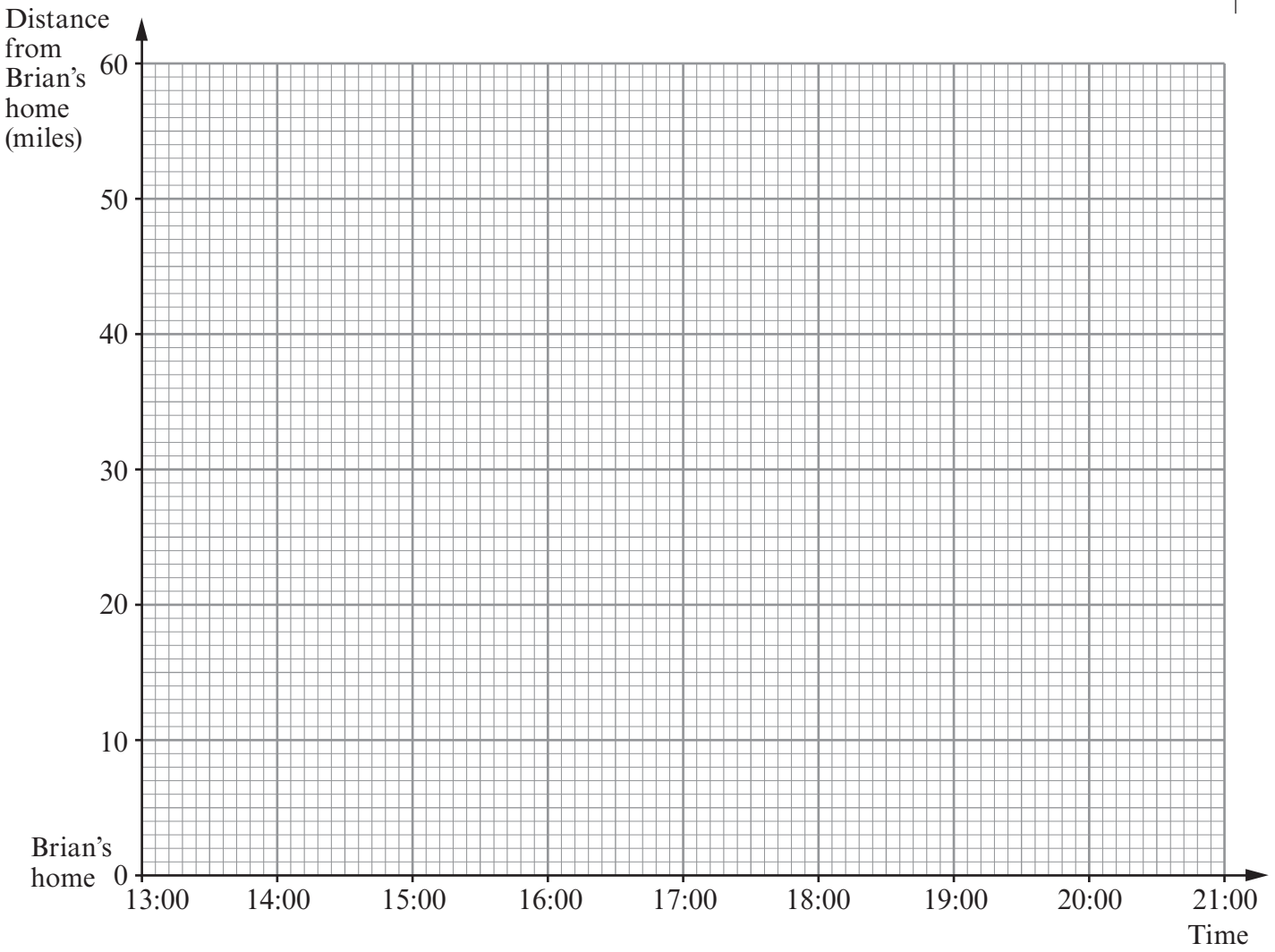
[2]

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13. Brian starts from home at 13:00 and travels at a constant speed, to visit his friend who is 60 miles away.
He takes one and a half hours to travel to his friend's house.
Once he arrives at his friend's house he stays for an hour and three quarters.
Travelling at a constant speed, his journey home takes two hours.

(a) Draw the travel graph to show Brian's journey. [3]



(b) How far was Brian from home at 17:00?

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[1]

Turn over.

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Examiner only

14. Sasha has designed a new two dimensional logo for her company.
The logo is to be printed on all official company paper.
A sketch of the logo is shown below.

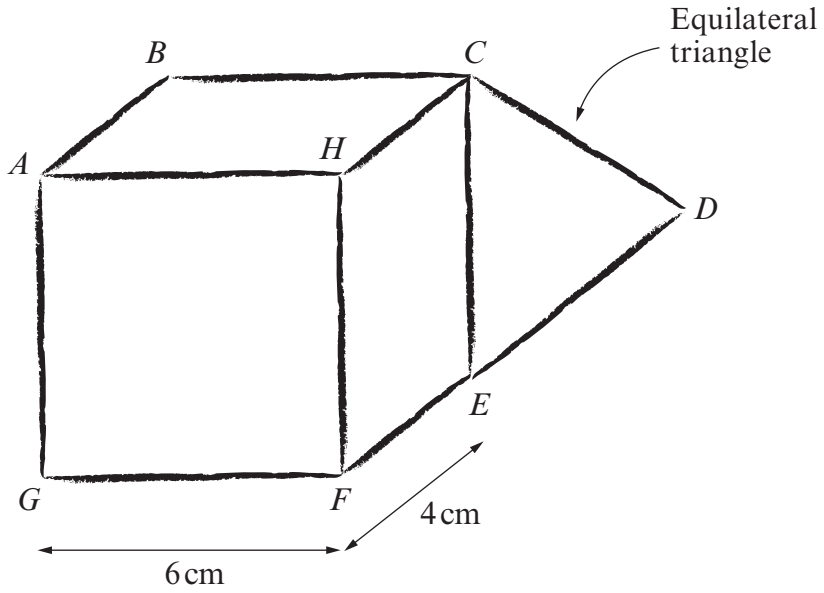


Diagram not drawn to scale

The idea for the logo is based on a 2-D representation of a cube with an accurate equilateral triangle attached to one edge.
On the logo, ***DEF* is a straight line**.

To help Sasha to draw an accurate version of the logo, she needs to identify what the actual lengths and angles will be on the logo.

(a) Write down the actual

size of $C\hat{E}D$ on the logo ..... °

length of CE on the logo ..... cm

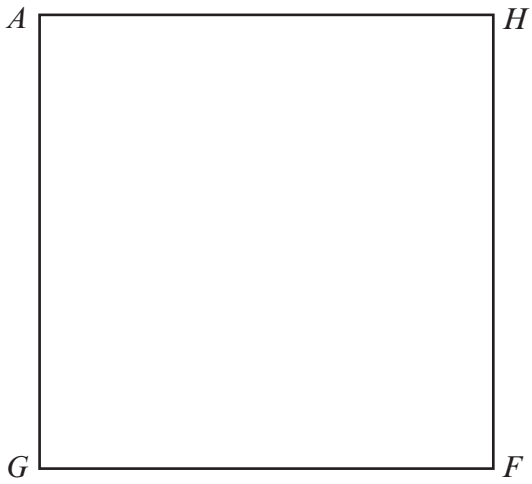
length of AB on the logo ..... cm.

[3]

(b) Complete the accurate drawing of the logo on the opposite page.
$AHFG$ has been drawn for you. [4]

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Examiner only



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Turn over.

Examiner only

15. Six hundred and seventy two pounds is given to Jane and Ian to be shared in the ratio 7:9. How much do they each receive?

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Jane receives ..... Ian receives .....

[3]

16. A solution to the equation

$$x^3 - 3x = 1$$

lies between and 1·8 and 1·9.

Use the method of trial and improvement to find this solution correct to 2 decimal places.

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[4]

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WJEC
CBAC

GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE APPLICATIONS OF MATHEMATICS. 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 1 – Foundation Tier

Applications U1 Foundation Tier January 2012	Mark	Comment
1.7319 + 6327 + 4978 + 1093 = 19717 19700	M1 A1 B1 3	Attempt to add 3 or 4 numbers CAO FT their total
2. (78 + 41 =) (£)119 (14.99 + 58.49=) (£)73.48 (119 – 73.48=) (£)45.52 left Valid reason eg he only has £45.52 left which is not enough money to buy the ticket and No stated or implied Look for • Correct units used • Spelling in at least 1 statement/sentence • Clarity of text explanation • Correct terminology • the use of simplified 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 answer	B1 B1 B1 E1 QWC 2 6	 Accept needs (£)138.48FT 'their 119' and 'their 73.48' FT for their calculations 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. Evidence of at least one car's information substituted into formula correctly with the correct answer For the correct times for all 3 cars Statement saying the least time taken was the 2nd car	M1 A1 E1 3	Any one correct answer implies M1 Time for: 1st car = 1.2 hours 2nd car = 0.8 hours 3rd car = 0.88 hours FT if M1 awarded Award SC1 for answers of 0.8, 1.25 & 1.1 and 1st car being shortest time.
4. (a) Wednesday (b) Adding numbers (= 791) 791÷7 Mean = 113 Put in order 30, 68, 68, 80, 120, 185, 240 Median = 80 Mode = 68 Range = 210	B1 M1 m1 A1 M1 A1 B1 B1 8	 Attempt to add numbers FT 'their 791' CAO
5. (a) circle drawn r = 4.5cm (b) (i) 8.6 (cm) or 86(mm) (ii) Identifying midpoint of base Correct position of top of triangle (c) 360 – (56 + 90 + 90) or implied equivalent eg 180 - 56 = 124 (°)	B2 B1 B1 B2 M1 A1 8	± 2mm B1 for circle radius 9cm ± 2mm ± 2mm. Look on diagram for evidence ± 2mm. Use overlay. For B2 FT 'their midpoint'. Award B1 for any perpendicular line drawn OR for any indication (dot) of being perpendicularly above 'their midpoint' at any height.

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Applications U1 Foundation Tier January 2012	Mark	Comment
6.(a) rectangle drawn Rectangle overlapping y-axis Rectangle with area > 31 cm^2 4 correct coordinates (b)Attempt to count area Estimate of area of their leaf within the range of 15 - 18	B1 B1 B1 B2 M1 A1 7	Accept square used. FT from their diagram. B1 for 2 or 3 coordinates correct. Reversed coordinates B0.
7. (a) slippers (b) 4/40 (c) Correct explanation given	B1 B1 E1 3	 ISW eg. No because you are asking more people and this may change the probability OR No when doing an experiment again it could give a different result OR any explanation of different proportion liking flip flops. Eg No because 7 could like flip flops
8. 3 × 16 + 1× 15 = 63 (99 – 63) = 36 (36 ÷ 12 =) 3 nights	M1 A1 B1 B1 4	 FT their 63 if M1 awarded FT their 36. Not dependent on M1
9. Idea of buying 4 for price of 3 or evidence of buying 4 lots of 4 tickets ((4.70 × 3) × 3 =)14.1(0) × 3 or 42.3(0) seen or implied (6.20 + 4.70 + 4.70 =) 15.6(0) seen £57.9(0) CAO	S1 B1 B1 B1 4	Eg. 4 free tickets Alternative method 11× 4.70 (=51.7(0)) B1 FT 'Their 51.7(0)' + 6.2(0) B1 £57.9(0) B1 CAO (£)76.7(0) B1 'their 76.70' – (4 × 4.70) or 18.8(0) seen B1 57.9(0) B1 CAO Award SC2 for answer of 62.6(0) from 15 × 4.7(0) + 6.2(0) – 3 × 4.7(0) (use of 3 free tickets) Award SC1 for incorrect answer to the above method
10. (a) 10119.74 (b) 10000	B2 B1 3	B1 for 10119.7(361) or 10120 FT their (a) rounded to 1 significant figure
11. (a) 062 (°) 150 (°) (b) Correct line from The Seabreeze Correct line from The Catcher Lines intersecting (c) 8 (cm) Multiplying by 5 = 40 cm or other correct units	B1 B1 M1 M1 A1 B1 M1 A1 U1 9	±2° ±2° Use Overlay. *If only 1 line drawn, the position of the harbour must be marked* FT if at least one M1 given ±2mm (accept 7.8 – 8.2 inclusive) FT their length
12.(a) 10g + 5h (p) (b) 2l + 2w (cm) or l + l ~+ w + w or 2(l + w) or equivalent	B2 B2 4	B1 for either 10g (or 10×g) or 5h (or 5×h) If B2, penalise further incorrect work -1 B1 for 2l or 2w or 2 × l + w If B2, penalise further incorrect work -1
13. (a) Journey from Brian's home to friends 1 ¾ hour stay at friends Journey home (b) 37-38 miles	B1 B1 B1 B1 4	Use Overlay FT 'their 1st part of the journey' FT 'their stay at friends' FT 'from their graph'

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Applications U1 Foundation Tier January 2012	Mark	Comment
14.(a) 60(°), 6(cm), 4 (cm) (b) Correct logo, all 3 areas, (see overlay) Tolerance in this question is $\pm$2mm,$\pm$2°	B3 B4 7	B1 for each correct answer *FT if at all possible from (a)* B3 2 areas correct with the other area slightly outside tolerance B2 2 of the areas correct B1 1 of the areas correct, but placement may be incorrect
15. 672 ÷ 16 = 42 Jane = (£)294 and Ian = (£)378	M1 A1 A1 3	
16. One correct evaluation (1dp) $1.8 \le x \le 1.9$ 2 correct evaluations $1.87 \le x \le 1.885$ One either side of 1 2 correct evaluations $1.875 \le x \le 1.885$ One either side of 1 1.88	B1 B1 M1 A1 4	x $x^3 - 3x$ 1.8 0.4(32) 1.81 0.4(997) 1.82 0.5(68) 1.83 0.6(38) 1.84 0.7(095) 1.85 0.7(81) 1.86 0.8(54) 1.87 0.9(29) 1.875 0.9(66) 1.88 1.0(0467) 1.89 1.0(81) 1.9 1.1(59) **1.885 1.0(428)** If values are not shown do not accept the use of statements such as 'greater than one and less than one' or 'too high and too low' Unsupported 1.88 gets B0 B0 M0 A0

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Unit 1 – Higher Tier

Applications U1 Higher Tier January 2012	Mark	Comment
1.(a) 10g + 5h (p)	B2	B1 for either 10g (or 10×g) or 5h (or 5×h) If B2, penalise further incorrect work -1
(b) x+y+z	B1	
(x+y+z)/3 or equivalent	B1	
(c) 2l + 2w (cm) or l + l + w + w or 2(l + w) or equivalent	B2	B1 for 2l or 2w or 2 × l + w or equivalent If B2, penalise further incorrect work -1
(d) Evidence of need to divide by 4	B1	
(£) q/4 or equivalent	B1 8	Accept q/(3+1)
2.(a) 60(°), 6(cm), 4 (cm)	B3	B1 for each correct answer *FT if at all possible from (a)*
(b) Correct logo, all 3 areas, (see overlay) Tolerance in this question is ±2mm,±2°	B4 7	B3 2 areas correct with the other area slightly outside tolerance B2 2 of the areas correct B1 1 of the areas correct, but placement may be incorrect
3(a) £6.2(0), £41, £18.75	B4	B3 for any 2 correct or £3.2(0), £38, £15.75 B2 for any 1 correct or any 2 of £3.2(0), £38, £15.75, B1 for correct working that could lead to any1 correct answer including the delivery charge Do not FT to (b) from incorrect prices in (a)
(b) Suitable explanation clearly mentions 101 boxes or more than 100	E2	E1 for a suitable explanation, but not referring to more than 100, perhaps refers to 100. Or for a partial explanation not mentioning the number of boxes exactly, just saying buy more Ignore inaccurate calculations
QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps. Graph axes are both labelled, appropriate joining of points, clear which lines relate to Box Clever and Box Galore **AND** • 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: Candidates will be expected to • present work clearly, with words explaining process or steps. Graph axes are both labelled, appropriate joining of points, clear which lines relate to Box Clever and Box Galore **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer		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) Both axes with suitable uniform scale	B1	Scale, i.e. > ¼ graph paper is used for plots
Accurate plots for Box Clever joined with a straight line from at least 10 to 50 and 50+ to 120 boxes	B2	FT scale. B1 for at least 3 correct plots, or plots and line would be accurate had the delivery charge not been omitted
(d) Box Clever Box Clever Boxes Galore	B1 12	CAO

Boxes Galore													
No.	*0*	*5*	*10*	*20*	*30*	*50*	*100*	*101*	*110*	*120*	*130*	*140*	*150*
£	*3*	*5*	*7*	*11*	*15*	*23*	*43*	*18.15*	*19.50*	*21*	*22.50*	*24*	*25.50*
Box Clever													
No.	0	5	10	20	30	50	51	60	70	80	100	120	150
£	2	3.50	5	8	11	17	17.25	19.50	22	24.50	29.50	34.50	42

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Applications U1 Higher Tier January 2012	Mark	Comment
4.(a) Explanation, e.g. "this information was not recorded", "don't know how many beans in the other boxes", "it doesn't say if more or less than 55"	M1	Do not accept 'No' with a reason related to specific data from the table demonstrating a misunderstanding of what the data tells the reader, M0, A0, i.e. using an argument based on 'not exactly 55' without engaging with 'least 55'
Conclusion: NO or DO NOT KNOW	A1	
(b) Explanation, e.g. "repeating an experiment usually gives different results", 'appears random'	M1	
Conclusion: NO	A1	
		Alternatively: Accept 'they could be similar as there is a small range', or 'similar as the machine is quite consistent', M1, A1 Allow SC1 for "No they are different", or equivalent statement– as an attempt to give a reason with 'no' stated, OR SC1 for 'similar' without giving a reason
(c)(i)		
(8) (15) (21) 30 38 48 56 62 71 80	B1	
(10) (20) 30 40 50 60 70 80 90 100	B1	
.8 .75 .7 .75 .76 .8 .8 .775 .788.. .8	B2	FT from their cumulative to last row Accept truncation to 2d.p.. Accept percentages B1 for any 6 correct, or all truncated to 1d.p.
		FT from (c) only if r.f.<1.5, %<150% (inverse from table) in (ii)
(ii) Uniform scale on vertical axis	B1	
Correct plots (allow joined or not joined)	B2	Need not start at 0. FT to plots if possible FT from (i) as condition stated above. B1 for 6 correct plots No FT to (iii) for either mark for r.f.>1
(iii) (0.8)	B1	
		Correct response or strict FT from their last relative frequency, but must be ≤ 1
Explanation: e.g. "last point plotted", "all data used"	B1	
		Do not accept references to most common, all round to 0.8, etc
(iv) Explanation: "more checks", or "collect more data", "re-do the experiment quite a few times to compare"	B1 14	
5.(a)(i) Mid points 1, 3, 5, 7	B1	
$1\times24 + 3\times16 + 5\times42 + 7\times18$ (=408)	M1	FT their mid-points (within & including bounds)
$\div 100$	m1	
(£)4.08	A1	Their $\Sigma fx \div 100$ Accept an answer of 4 from work seen. FT from their correct Σfx evaluated, M1 and m1
(ii) (£)7.99	B1	
(b)(i) 234, 257, 332, 334	B3	OR B2 for any two correct entries, OR B1 for a correct method seen, or one correct entry
(ii) Explanation: e.g "smoothed out data" , 'overview'	E1	
(iii) Noticing not true from raw data (but is from looking at moving average)	E1 10	Accept 'estimates (profit) over a period of time'
6.(a) Entries 20 55 95 100	B1	
(b) Correct cumulative frequency diagram, points plotted and joined with a curve or straight lines	B2	FT from cumulative (a). B1 points plotted but not joined, correct diagram with 1 point incorrectly plotted, or correct apart from be a 0.5 horizontal translation
(c) Median (approximately 164)	B1	From their cumulative diagram only
Intention to subtract horiz. reading for vertical 75 &25	M1	(Approximately 166 – 162)
Interquartile range (approximately 4)	A1	
		FT from (c) if possible, if LQ and UQ given
(d) Horizontal scale correctly indicated	B1	Do not penalise break in scale not indicated
Range correct as whiskers, from 155.5 to 170.5	B1	Accept 156 to 170
LQ, median, UQ to form box	B2 10	FT their answers. B1 if one error

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7.Straight lines parallel to all 4 sides and 3cm away (±2mm) Arcs with radius 3cm (±2mm) at all 4 vertices All arcs joined to straight lines to give the correct locus (±2mm)	B2 B2 B1 5	B1 for straight lines parallel to 2 sides and 3cm away (±2mm), OR straight lines parallel to all 4 sides but not at 3cm, but consistent distance B1 for arcs with radius 3cm (±2mm) at 2 vertices, OR arcs at all 4 vertices but not at 3cm CAO
8.Use of 1 km = 100 000 cm Use of 2Πr OR Πd for either wheel 100 000/ Πd or equivalent For 60cm, Zen: 530.5 to 530.8 (cm) For 70cm, Tom: 454.7 to 455 (cm) Difference 75.78 to 75. 83 (cm) 76 (cm to 2 s.f.)	B1 B1 M1 A1 A1 A1 A1 7	Or equivalent, e.g. all conversions to m *Πd is 188.4 to 188.5 and 219.8 to 220* FT their 100 000 (i.e. place value error), or their use of 60, 70 as r instead of d CAO. Maybe implied by final correct answer CAO. Maybe implied by final correct answer FT provided M1 awarded and units consistent FT provided M1 awarded and units consistent Premature rounding is PA-1 *Watch out for equivalent method, award A marks accordingly for similar stages*
9.For x+y = 4 : Any 2 points found correctly Correct straight line drawn For quadratic: Any 4 points found correctly All **necessary** points are plotted correctly Correct **curve** extending as a minimum between x= 1 and x=4 x = 4, y = 0 x = 1, y = 3	B1 B1 M1 P1 A1 B1 B1 7	<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>-1</td><td>-2</td></tr></table> <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>8</td><td>3</td><td>0</td><td>-1</td><td>0</td><td>3</td><td>8</td></tr></table> FT from their line with a curve provided at least 1 intersection
10. Idea to find areas 2 triangles and 3 trapezia 18 + 37 + 35 + 23 + 7 120 m or metres	M1 A2 A1 U1 5	Or equivalent A1 for any 3 of the 5 areas correct Other A marks are included by sight of 120 Independent of other marks
11.Stages of working: evidence of understanding1/x inverse of squaring being √ 6.7×10^8	M1 M1 A1 3	In either order CAO
12.(a) Attempt to find area information for >70 4×10 + 2×10 +0.6×10 (= 40 + 20 + 6) = 66 (b) Groups of equal width 30 For the groups: 0 to 30, 30 to 60, 60 to 90, 90 to 120 15 150 120 6 Division by 30 Frequency densities: 0.5, 5, 4, 0.2 Suitable axes with scales and with label frequency density Attempt to construct histogram with groups of width 30 Correct histogram (c) Suitable explanation referring to the 1st being the more appropriate, e.g. 'more accurate', 'shows 70'	S1 M1 A1 S1 M1 A1 m1 A1 B1 M1 A1 E1 12	 Allow 1 error in an area CAO FT from (a) to (b) for all marks if 1 slip with area in (a), but must be working with areas Correct attempt to find 15, 150, 120, 6 (15 150 120 6) For their data, but not to suit15, 150, 120, 6. May be the same as in (a) Must have bars with no gaps. FT for their FD, but not 15, 150, 120, 6 FT their 1 slip in area from (a)

Candidate Name	Centre Number	Candidate Number
		0

GCSE LINKED PAIR PILOT

4361/01

APPLICATIONS OF MATHEMATICS

UNIT 1: APPLICATIONS 1

FOUNDATION TIER

A.M. TUESDAY, 21 June 2011

1½ 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 **17**.

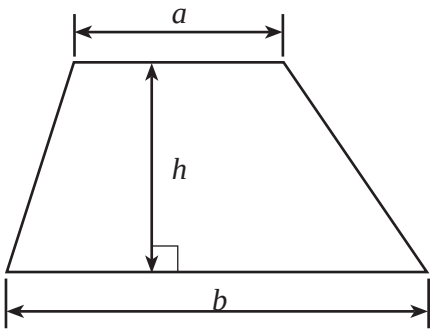
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**8**	
2	**7**	
3	**3**	
4	**4**	
5	**6**	
6	**4**	
7	**4**	
8	**4**	
9	**2**	
10	**3**	
11	**3**	
12	**4**	
13	**3**	
14	**6**	
15	**6**	
16	**5**	
17	**8**	
TOTAL MARK		

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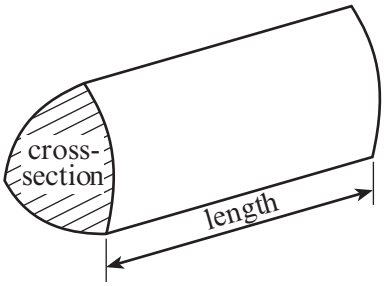
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Formula List

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



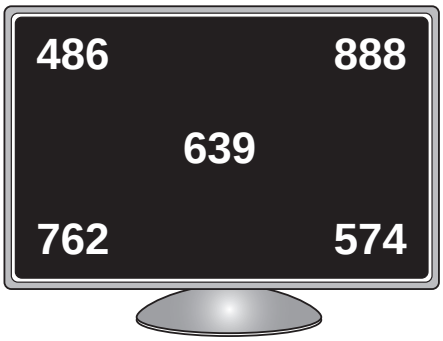
Volume of prism = area of cross-section × length



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Examiner only

1. *(a)* A game shows numbers on a screen.



Write down the numbers which are

(i) smaller than 865 AND greater than 535,

.....

[1]

(ii) smaller than 865 AND greater than 535 AND even,

.....

[1]

(iii) smaller than 865 AND greater than 535 AND even AND divisible by 3.

.....

.....

[1]

(b) The following table shows the costs to see a film in the cinema.

	Mon, Wed, Thurs, Sun	Fri & Sat	Tues
Adult	£6.40	£6.75	£3.20
Concession	£4.70	£4.85	£2.65
Child	£4.30	£4.55	£2.30

Two adults and three children want to go to the cinema to see the latest blockbuster. How much would they save altogether if they go on a Tuesday rather than a Wednesday?

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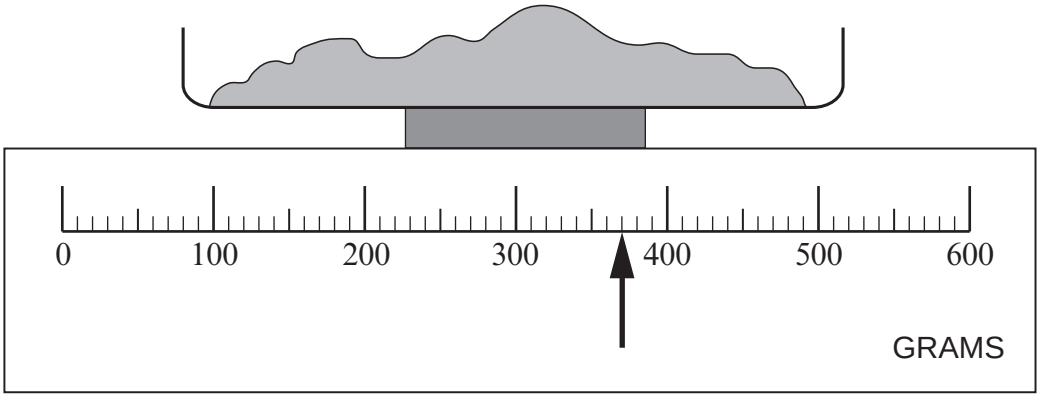
[5]

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2. *(a)* The scale is used to weigh sugar for making a cake.



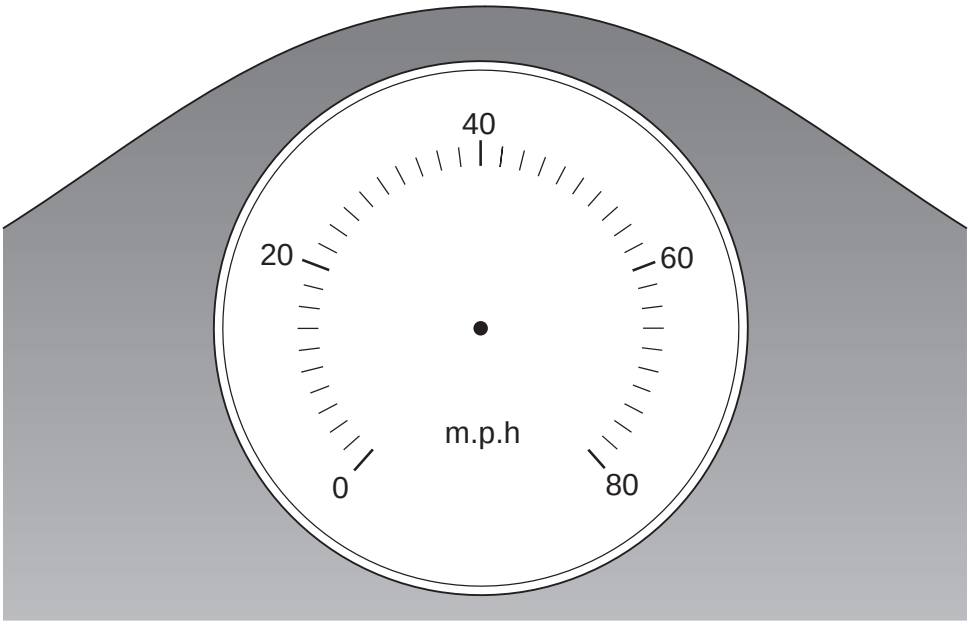
What does the sugar weigh?

Weight of sugar = ... grams

[1]

(b) Draw an arrow on the following speedometer to show a speed of 48 m.p.h.

[1]



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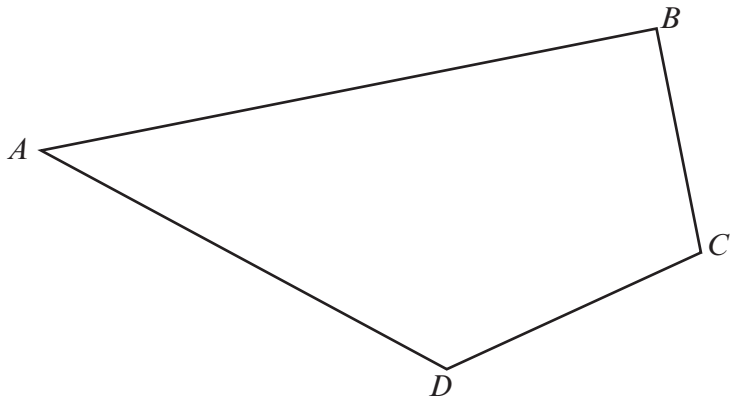
Examiner only

(c) Draw a circle with a radius of 5 cm.

[1]

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(d) A piece of a jigsaw $ABCD$ is shown below.



Measure and write down

(i) the size of $A\hat{D}C$,

.....

[1]

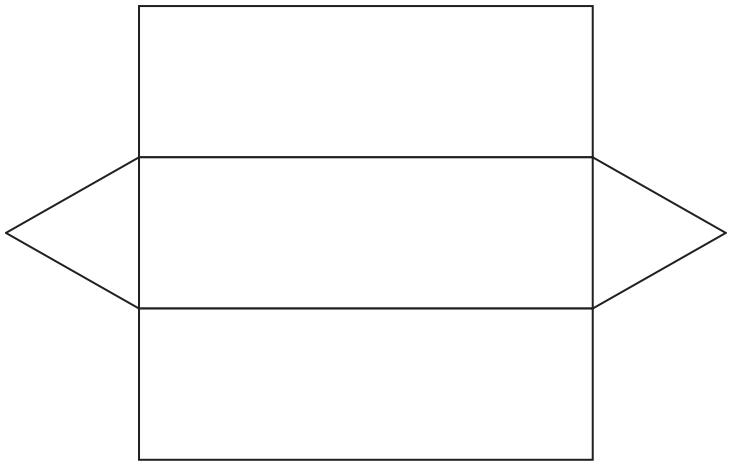
(ii) the length of the line that is perpendicular to BC.

.....

[1]

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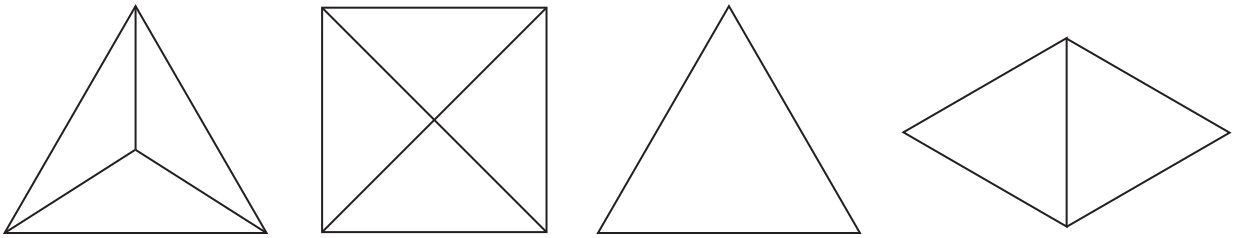
(e) The net of a gift box is shown below.
What is the name of the 3D shape made from this net?



Name = ...

[1]

(f) The shape of another gift box is a triangular based pyramid (tetrahedron).
Which of the following diagrams shows the top view of this gift box?



A **B** **C** **D**

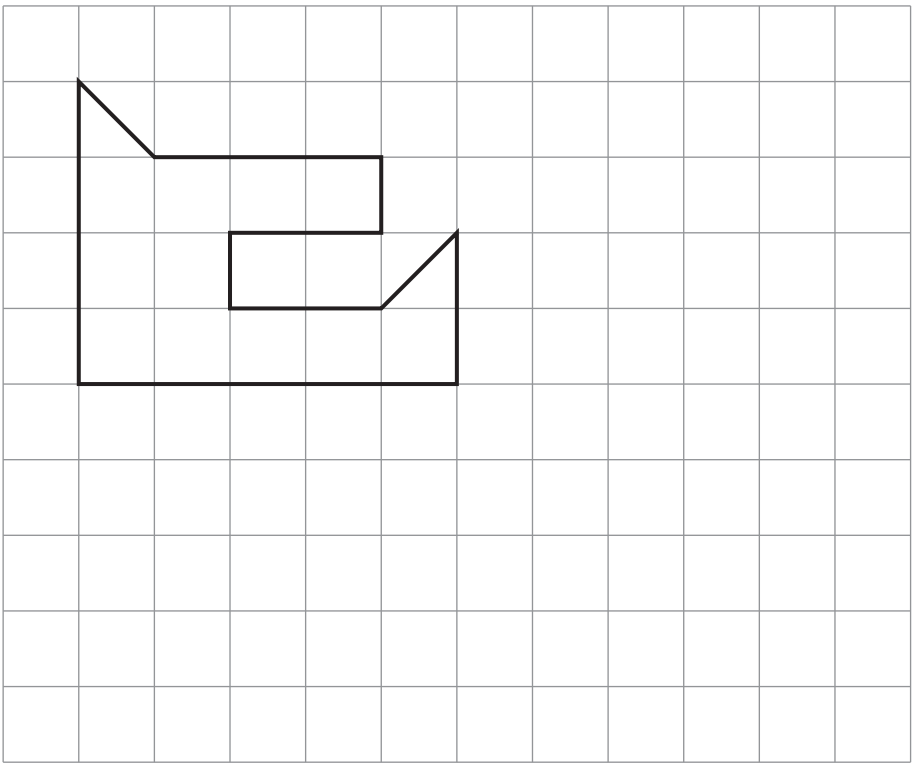
Diagram = ...

[1]

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Examiner only

3. Jane was asked by her advertising company to design a logo. Jane's initial logo is shown below on the centimetre square grid.



(a) What is the area of Jane's initial logo?

.....

[1]

(b) The company decides that they want a simple logo of a rectangular shape but want to use the same area as Jane's initial design.
On the grid above, draw a possible shape of the new logo.

[2]

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4. The information in the table below was printed in a daily newspaper during the month of December.

City	Maximum daytime temperature (°C)	Minimum night-time temperature (°C)
Cardiff	6	–3
Moscow	–5	–14
Sydney	26	13
Helsinki	–1	–9
Cape Town	30	18

Use the given information to answer the following.

(a) Which city had the lowest minimum night-time temperature?

.....

[1]

(b) Which city had the highest maximum daytime temperature?

.....

[1]

(c) What is the difference between the minimum night-time temperatures in Cardiff and Sydney?

.....

.....

[1]

(d) Which **two** cities had a difference of 7°C in their maximum daytime temperatures?

.....

.....

[1]

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5. Angharad plays netball for her local team. The number of goals she has scored in her first seven games is 3, 4, 5, 5, 6, 8 and 9.

(a) Explain why the mode is 5.

.....

.....

.....

[1]

(b) Calculate the mean number of goals scored by Angharad in the first seven games.

.....

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.....

.....

[3]

(c) Angharad's coach thinks that it is possible for Angharad to achieve a median of 6 and a range of 7 after two more games are completed.
Give the possible number of goals scored in each of the next two games that would allow Angharad to achieve this.

.....

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.....

[2]

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Examiner only

6. A taxi firm advertisement is shown below.

Fred's Cabs



Taxi Fare = Number of miles travelled × £1.80 + £3.10

(a) Samina travels by taxi from the train station to her home which is 24 miles from the station. How much will her taxi fare be?

.....

.....

.....

[2]

(b) Ciaran travelled by taxi.
He paid £37.30 for the journey.
How many miles did Ciaran travel?

.....

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.....

.....

[2]

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7. George has interviews for management jobs.
He receives offers for four different jobs.

Job 1	£33 500 per year
Job 2	£2850 per month
Job 3	£1300 per fortnight
Job 4	£652 per week

Which of the four jobs pays the highest **yearly wage**? You must show **all** your working.

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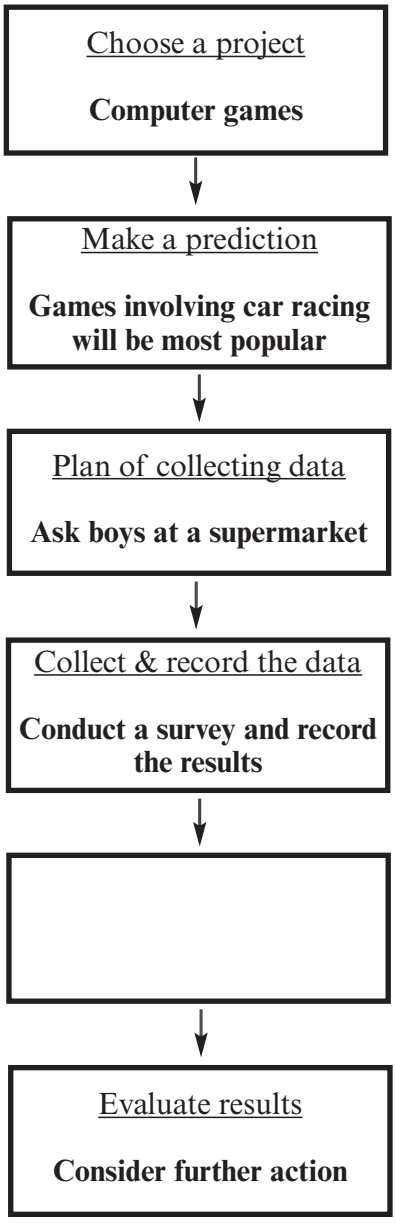
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[4]

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8. *(a)* Sam wants to investigate which computer game is the most popular.
He decides to plan what he needs to do in order to carry out his investigation.
The following shows some of the steps that Sam has planned so far.



(i) What do you think the missing step is in Sam's plan?

.....

.....

[1]

(ii) Suggest a way of improving the third step, 'Plan of collecting data', in Sam's plan.

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[1]

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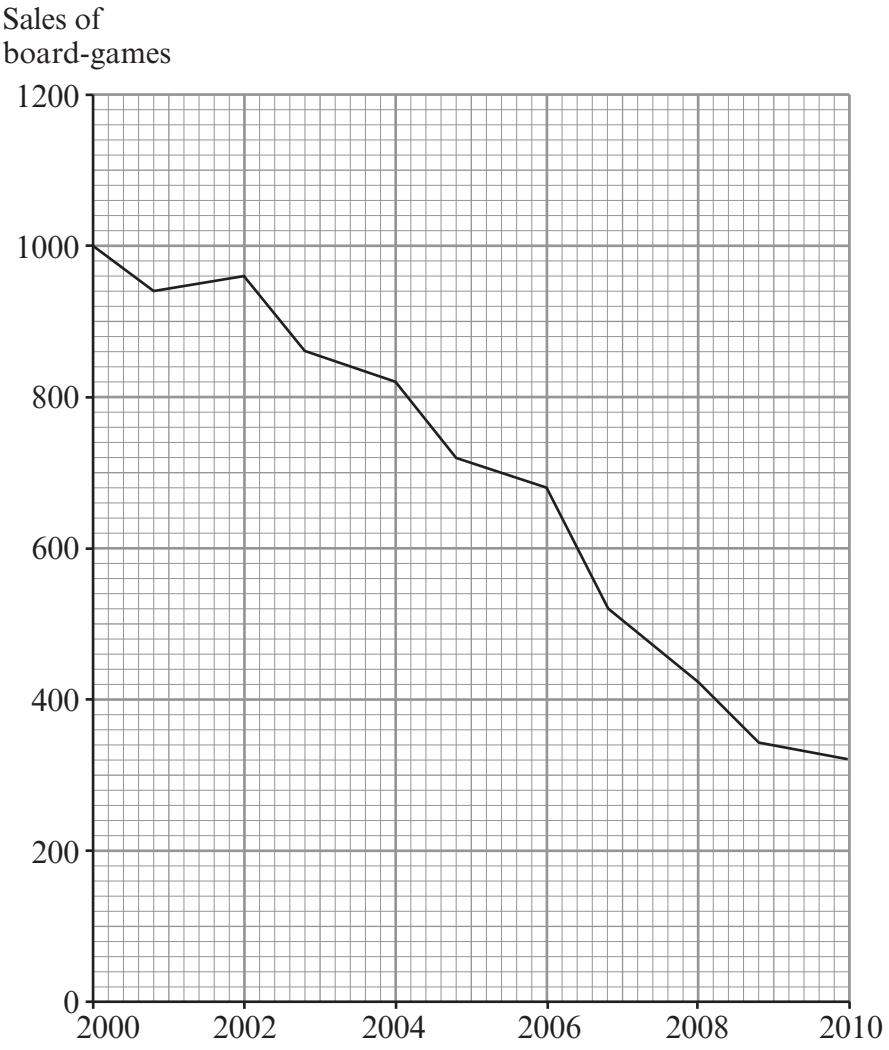
(iii) What type of diagram could Sam use to present the data that he has recorded?

.....

.....

[1]

(b) Sam's friend Siân investigates the sales of board-games in a local shop.
The following graph shows her results for the sales of board-games over the past 10 years.



Comment on Siân's results of the sales of board-games over the past 10 years.

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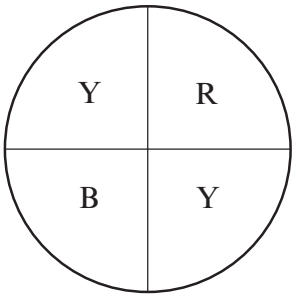
[1]

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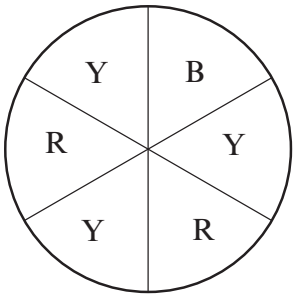
Examiner only

9. Kyle and Ethan play a game using a spinner. A player wins when the spinner stops on their chosen colour. A player can choose from the colours Yellow (Y), Black (B) or Red (R).
Kyle always chooses Red.
Ethan always chooses Yellow.
Which of the following spinners should Ethan choose so that he has the greatest chance of beating Kyle?
Give a reason for your answer.

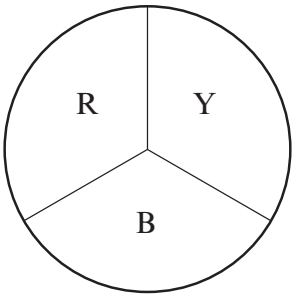
SPINNER 1



SPINNER 2



SPINNER 3



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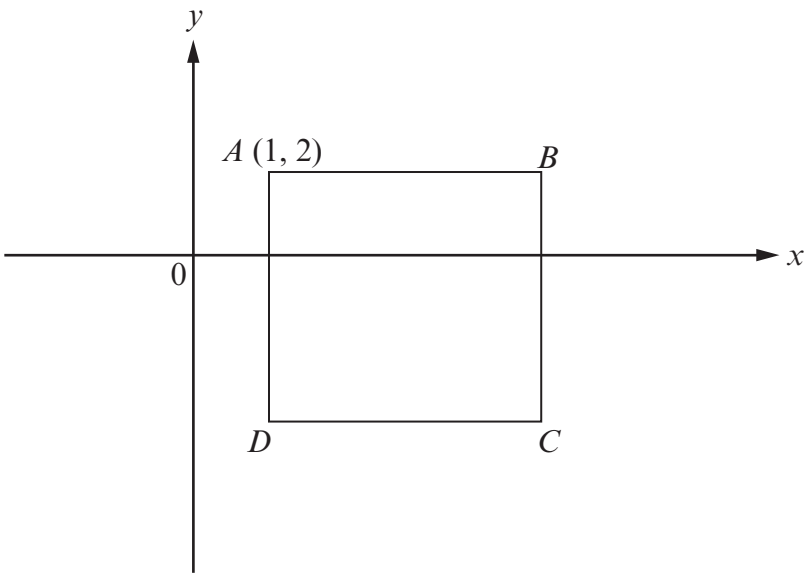
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[2]

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10. A square, $ABCD$ has sides of length 5 units.
Find the coordinates of point C.



Coordinates of C = (..... , ...)

[3]

11. *(a)* Find the value of $\dfrac{4{\cdot}32^3 - 12{\cdot}6}{\sqrt{25{\cdot}8}}$, giving your answer to 2 decimal places.

.....

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.....

.....

[2]

(b) The number of people who bought tickets for a pop concert was 56 721.
Round this value to 2 significant figures.

.....

.....

[1]

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12. Charlie has x sweets.
Lisa has 3 more sweets than Charlie.
Julian has twice as many sweets as Lisa.
How many sweets do Charlie, Lisa and Julian have altogether? Simplify your answer as far as possible.

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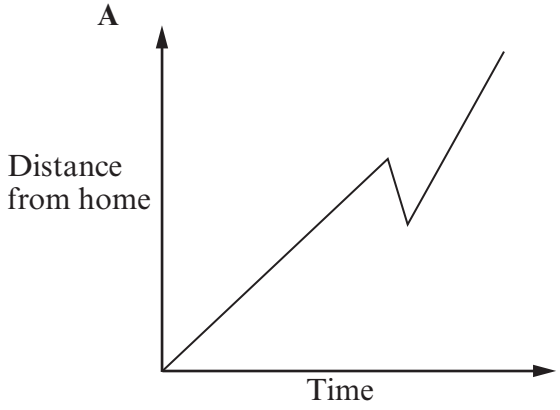
[4]

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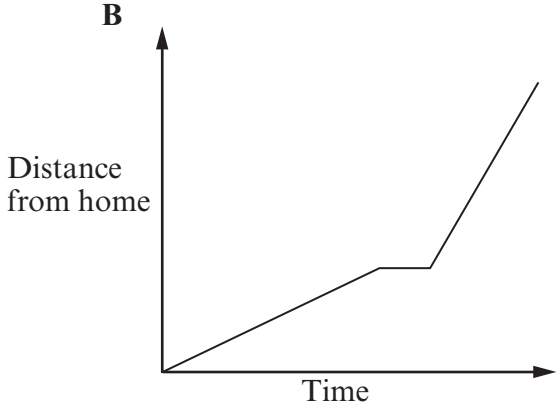
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13. Sammi left home and drove to work. Along the way she had to stop at a school crossing. She then travelled at an increased speed until she arrived at work.
Which graph best shows her journey? Give a full explanation for your answer.

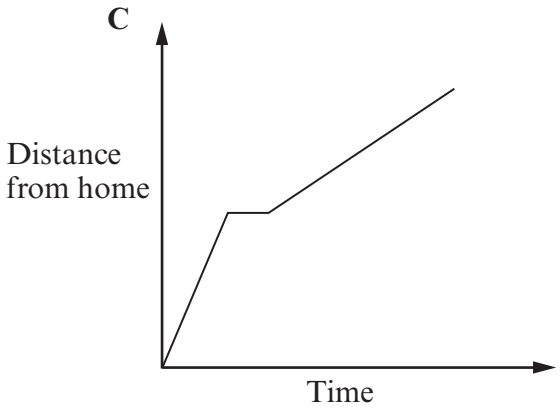
A



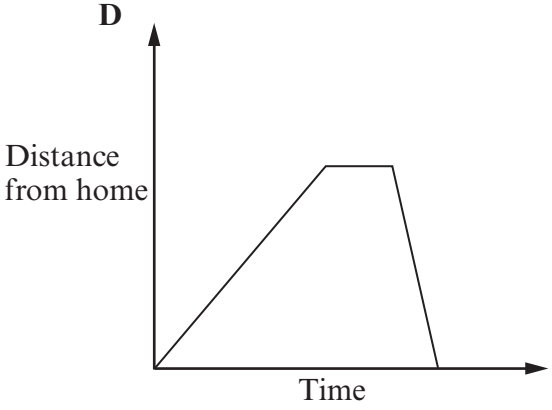
B



C



D



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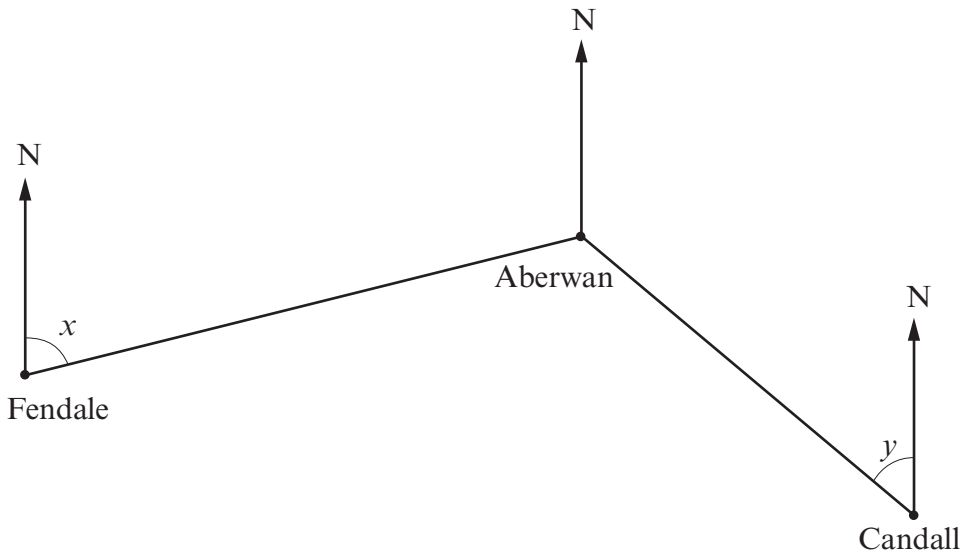
.....

[3]

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14. The diagram shows three places Fendale, Aberwan and Candall in the positions that they would appear on a map drawn to scale.



(a) Measure the angles marked x and y on the diagram.

x = ...°

y = ...°

[2]

(b) Find the bearing of

(i) Aberwan from Fendale,

.....

[1]

(ii) Fendale from Aberwan.

.....

[1]

(c) Find the bearing of Aberwan from Candall.

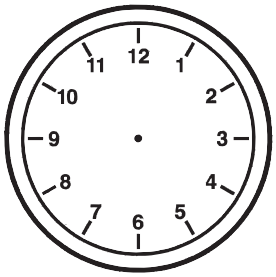
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[2]

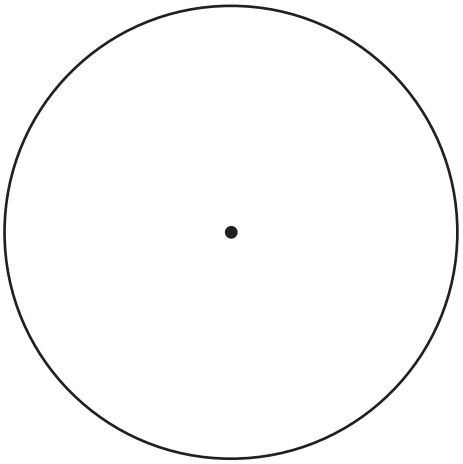
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Examiner only

15. *(a)* A clockface is to be designed using a single dot in place of each number.



Use the circle opposite to mark accurately the positions of the 12 dots on the clockface.
The centre of the clock has been marked for you.
You **must** show **all** your lines joining the centre of the clock to the dots.



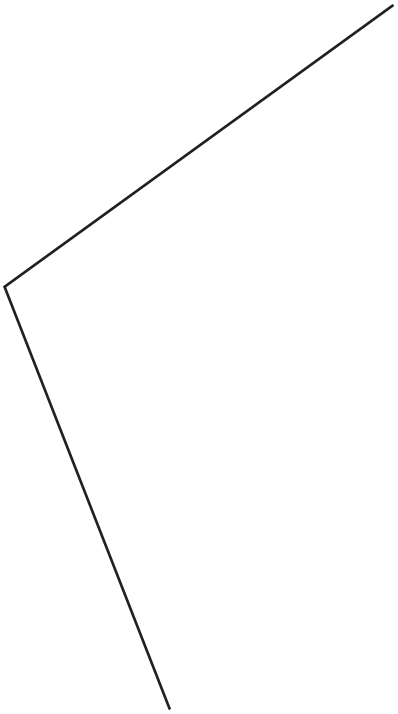
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.....

[3]

(b) Use a pair of compasses and a ruler to bisect the obtuse angle shown below.
You **must** show **all** of your construction marks on the diagram.



[3]

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16. Davina is entering a kite flying competition.
To enter the competition, Davina's kite must meet all the requirements below.

- The diagonals of the kite are perpendicular.
- The shorter diagonal must be 25 cm.
- The longer diagonal must be 48 cm.
- The shorter diagonal of the kite must cut the longer diagonal in the ratio 3:5.

Using a scale of 1:5, construct a scale drawing of Davina's kite for the competition.
You **must** show **all** your working.

.....

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.....

.....

.....

[5]

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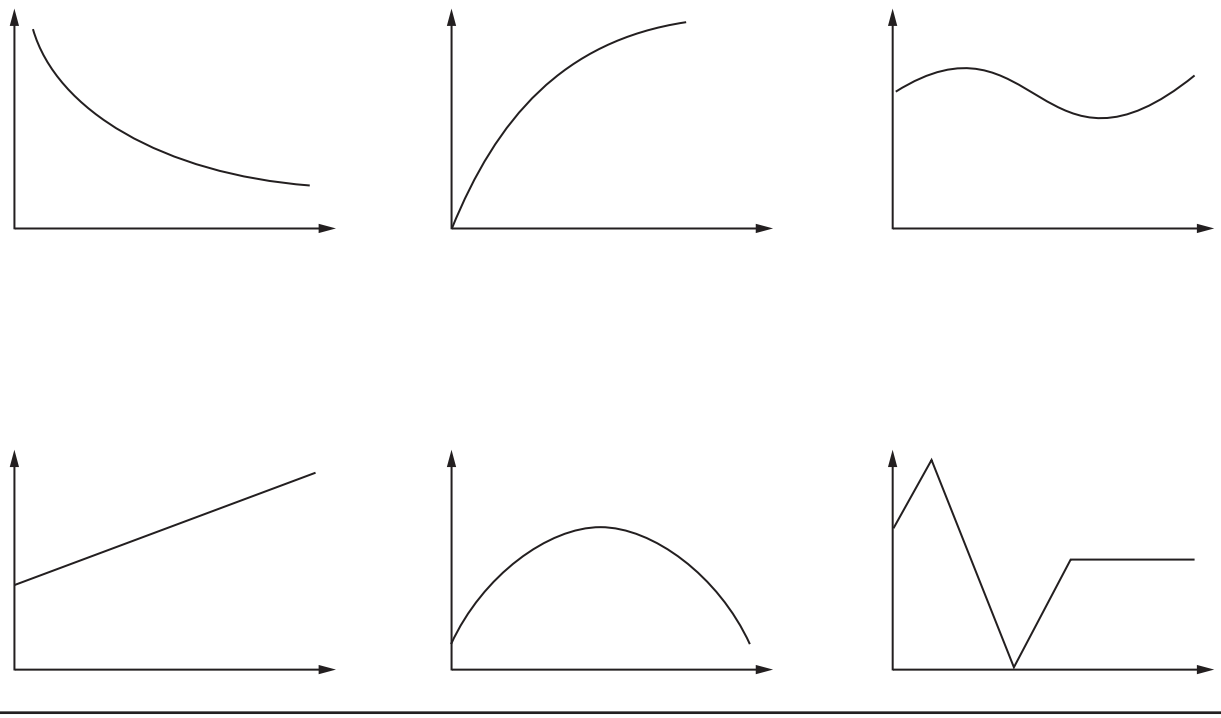
17. *You will be assessed on the quality of your written communication in this question.*

Michelle has cut out two headlines and a number of graphs from newspapers.
She has cut off the labels and scales from the graphs so that she is left with simple sketches of the original graphs.
Each headline originally had a matching graph.

Headlines

- More ice creams are sold in the summer than in the winter in South Wales.
- Vast increase in sales of bicycles in the South East of England.

Michelle's sketches of the graphs



On the opposite page, for **each** of the headlines

- select an appropriate sketch from above and draw it in the box opposite,
- label the axes,
- explain why the graph matches the headline.

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- More ice creams are sold in the summer than in the winter in South Wales.

Graph

Explanation

.....

.....

.....

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.....

.....

- Vast increase in sales of bicycles in the South East of England.

Graph

Explanation

.....

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.....

.....

.....

.....

[8]

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WJEC
CBAC

GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2011 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

GCSE APPLICATIONS OF MATHEMATICS

UNIT 1 - FOUNDATION TIER

Applications of Mathematics June 2011 Unit 1 Foundation Tier	Mark	Comments Post conference version
1. (a) 639, 762, 574 762, 574 Answer = 762 (b) 2 × 3.20 + 3 × 2.30 (6.40 + 6.90) = 13.3(0) 2 × 6.40 + 3 × 4.30 (12.80 + 12.90) = 25.70 Saved (£)12.4(0)	B1 B1 B1 M1 A1 M1 A1 A1 8	 Alternative method 2 x 3.20 = 6.40 3 x 2 = 6 Total saving 12.40 Or (3×4.30) – (3×2.30) M1 = 6.40 A1 (2×6.40) – (2×3.20) M1 =6.00 A1 Saved (6.40 + 6.00) 12.40 A1 FT for one arithmetic error for final A1, both M marks must be awarded.
2. (a) 370 (grams) (b) Arrow at 48 m.p.h. (c) circle drawn, r=5cm (d) (i) 127° (ii) 8.3 cm (e) Triangular prism (f) A	B1 B1 B1 B1 B1 B1 B1 7	 Arrow >47 and <49 ± 2 mm ± 2° ± 2 mm
3. (a) 12 (cm^2) (b) Rectangle drawn with area of 12 (cm^2)	B1 B2 3	 Either 6 × 2, 12 × 1 or 4 × 3 B1 for drawing a rectangle. Or B1 for a shape of area 12(cm^2) FT 'Their area' if a rectangle drawn
4. (a) Moscow (b) Cape Town (c) 16° (d) Cardiff and Helsinki	B1 B1 B1 B1 4	Accept clear abbreviations for cities such as M, CT, C, H, S Accept -16
5. (a) Suitable explanation (b) Attepmt to add numbers (= 40) 40÷7 = 5.7(14……) (c) For 2 correct values that give a range of 7 AND a median of 6.	E1 M1 m1 A1 B2 6	Eg. 5 is the most popular number FT 'their total'÷ 7 CAO Accept answer of 6 from correct workings shown Eg 9 & 10, 10 & 10, 6 & 10, 7 & 10, 8 & 10 B1 for 2 values that either give a range of 7 or a median of 6. OR B1 for 10 shown.
6. (a) 24 × 1.80 + 3.10 = (£)46.3(0) (b) (37.30 – 3.10) ÷ 1.80 = 19	M1 A1 M1 A1 4	Multiplying and adding For 24 × 1.80 + 3.10 = 117.60 M0 A0 For showing a subtraction then a division Accept embedded 19.

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Applications of Mathematics June 2011 Unit 1 Foundation Tier	Mark	Comments Post conference version
7. Job 2 (= 2850 × 12) = 34 200 Job 3 (= 1300 × 26) = 33 800 Job 4 (= 652 × 52) = 33 904 Highest = £34 200 or Job 2	B1 B1 B1 B1 4	 If candidates correctly evaluate 24 and 48 weeks respectively for jobs 3 & 4 Award B0, B1. FT their answers No workings and Job 2 given as final answer award B0
8(a)(i) Suitable entry for the table (ii) Suitable suggestion (iii) Suitable diagram/chart (b) Appropriate comment.	B1 B1 B1 E1 4	Eg. Display/represents the data, analyses the data, find outcome of data, draws a graph, Adds up results, calculates results. B0 for Give out results Eg. Ask girls and boys or asks people in town or asks outside a computer store Eg. Tally chart/bar chart/line graph Eg. The sales have decreased.
9.Spinner 1 Suitable explanation.	B1 E1 2	 Eg. Ethan has 50% chance of a yellow & Kyle has 25% of a red.
10. Suitable strategy used (6, -3)	S1 B2 3	Evidence on diagram or if at least 1 correct coordinate B1 for either coordinate. If only one coordinate correct award S1 B1 *for (-3, 6) award S1 only*
11. (a) 13.39 (b) 57000	B2 B1 3	B1 for 13.3(9173312) or 13 or 13.4
12. Lisa = $x + 3$ ISW Julian = $2(x + 3)$ ISW Expansion of bracket = $2x + 6$ $4x + 9$	B1 B1 B1 B1 4	 Accept $2 \times x + 3$ or $x + 3 \times 2$. FT $2 \times$ their Lisa if Lisa $ax + b$ where $b \neq 0$ FT if $2(ax \pm b)$
13. Graph B **Reference to horizontal line representing a stop** **Reference to steeper line after stop or less steep before stop** 	B1 E1 E1 3	 This can be gained from graphs B, C, D
14. (a) x = 76° y = 50° (b)(i) 076 º (ii) 256 º (c) 360 – (50 $\pm$ 2º) 310º	B1 B1 B1 B1 M1 A1 6	±2° ±2° FT from 'their x' FT from 'their x' or FT 180 + their (i). Accept if re-measured $\pm$ 2º. FT 360 - 'their y' $\pm$ 2º

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Applications of Mathematics June 2011 Unit 1 Foundation Tier	Mark	Comments Post conference version
15.(a) Completely accurate (through the centre, 30° ± 2°) with lines towards circumference (need not touch the circumference) (b) Appropriate arcs (dashes) shown on both lines Intersection arcs shown, using first set of arcs Angle bisector drawn	B3 M1 M1 A1 6	B2 for at least 6 of the sectors accurate ± 2°, towards but not necessarily touching the circumference or shown by dots, OR B1 for sight of (360÷12 =) 30 ± 2 mm ± 2 mm. FT from their arcs if ± 3 mm. FT from 'holes' from where arcs should be. FT if M0, M1 awarded SC1 if steps of process seen but slightly outside tolerance, OR SC1 if assumed lines are equal with 1 set of arcs with bisector shown
16. Longer diagonal 9.6cm (drawn as a diagonal or in working) Longer diagonal split 3.6cm & 6cm or calculated as 18cm & 30cm Diagonals intersect at right angles Shorter diagonal 5 cm (drawn as a diagonal or in working) Correct scale drawing of the kite	 B1 B1 B1 B1 B1 5	Watch for answers in the information table given All measurements ±2 mm or ±2° SC1 for a drawing with sides 9.6cm, 9.6cm, 5cm and 5cm(±2 mm). Candidates awarded this SC1 can also access the B1 for the diagonals shown intersecting at right angles.
17. Appropriate choice of sketch Axes labelled appropriately Appropriate reason for their choice of sketch Look for • relevance • spelling • clarity/flow of text explanations Ignore previous errors in not labelling axes or in their reasoning For QWC2 need at least 1 statement/sentence in both parts of the question, otherwise maximum is QWC1 if the spelling and flow of text is satisfactory QWC2: Candidates will be expected to • present work clearly, with words explaining choices 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 choices OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	B1 B1 B1 **×2** QWC 2 <

UNIT 1 - HIGHER TIER

Applications of Mathematics Unit 1 June 2011 Higher Tier		Comments Post conference version
1.(a) Completing the table correctly (b)(i) 1/36 (ii) 1/36 (iii) 5/36 (c) 2 AND 12 (d) 1/2	B1 B1 B1 B1 B2 B1 7	 ISW. FT for their completed table in (b) and (c) ISW ISW B1 for each answer. Accept double 1 AND double 6 ISW
2.(a)(i) 076 (º) (ii) 256 (º) (b) 360 – (50 ± 2º) 310(º)	B2 B1 M1 A1 5	± 2º. Award B1 if 0 omitted FT 180 + their (i). Accept if re-measured ± 2º. ± 2º
3.(a) Completely accurate (through the centre, 30° ± 2°) with lines towards circumference (need not touch the circumference) (b) Appropriate arcs (dashes) shown on both lines Intersection arcs shown, using first set of arcs Angle bisector drawn	B3 M1 M1 A1 6	B2 for at least 6 of the sectors accurate ± 2°, towards but not necessarily touching the circumference or shown by dots, OR B1 for sight of (360÷12 =) 30 ± 2 mm ± 2 mm. FT from their arcs if ± 3 mm. FT from 'holes' from where arcs should be. FT if M0, M1 awarded SC1 if steps of process seen but slightly outside tolerance, OR SC1 if assumed lines are equal with 1 set of arcs with bisector shown
4.(a) $2\times(8.5 + 4.6) + 4 \times 2.2$ (+ 18) and no others = 53 (cm) (b) $2\times l + 2\times w + 4 \times h + 18$ (and no extras)	M1 A1 B2 4	Or equivalent. Attempt to consider all 6 sides (+ 18) CAO. *An answer of 35 implies M1* B1 for 1 error or 1 slip in notation. Treat an answer of l + w + 4×h + 18 is 1 error (omit bottom), hence award B1. If B2 penalise extra incorrect working -1
5. (a) A $y = 3a + 3b - b$ $y = 3a + 2b$ B $y = a^2 + (1)a + b$ C $y = 3a + 2b$ D $y = 2ab + 2b + 3a – 2ab$ $y = 3a + 2b$ (b) A, C and D	 B1 B1 B1 B1 B2 B1 B1 8	In this question do not ignore further incorrect working, mark final answer FT until second error CAO CAO B1 for each bracket expanded correctly FT from one error in 1 of the 4 terms FT provided at least two of the three are correct
6. Longer diagonal 9.6cm (drawn as a diagonal or in working) Longer diagonal split 3.6cm & 6cm or calculated as 18cm & 30cm Diagonals intersect at right angles Shorter diagonal 5 cm (drawn as a diagonal or in working) Correct scale drawing of the kite	 B1 B1 B1 B1 B1 5	Watch for answers in the information table given All measurements ±2 mm or ±2° SC1 for a drawing with sides 9.6cm, 9.6cm, 5cm and 5cm(±2 mm). Candidates awarded this SC1 can also access the B1 for the diagonals shown intersecting at right angles.

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Applications of Mathematics Unit 1 June 2011 Higher Tier		Comments Post conference version
7. Appropriate choice of sketch Axes labelled appropriately Appropriate reason for their choice of sketch Look for • relevance • spelling • clarity/flow of text explanations Ignore previous errors in not labelling axes or in their reasoning For QWC2 need at least 1 statement/sentence in both parts of the question, otherwise maximum is QWC1 if the spelling and flow of text is satisfactory QWC2: Candidates will be expected to • present work clearly, with words explaining choices 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 choices OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	B1 B1 B1 <u>×2</u> QWC 2 8	 Minimum is label for axes, not scales, or vv If no scale, the scale must be described in order to get the reason mark. Ignore extra incorrect reasoning, if appropriate reasoning seen <u>NO marks for an inappropriate choice of sketch</u> 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.
8.(a) Suitable uniform scales on both axes with vertical to at least 700 & horizontal to at least 10 At least 3 points plotted accurately including times at (1 or 2) and 10 minutes (b)(i) (£)590 Explanation that intermediate points between whole number are invalid, or mentions 'jumps' in the graph or similar	B1 P2 B1 E2 6	Any break in scale must be indicated, or labelled to the end Maybe implied by a correct straight line through times 1 and 10 P1 for one point correct (maybe 0,500) Not a FT from an incorrect graph E1 if explained using values rather than generalised, OR E1 for correct but includes incorrect element, e.g. mentions rounding up and down, OR E1 for mention of always rounding up, OR E1 for a partial explanation
9. 22600×85 $\times 1000$ 1.9×10^9	M1 A1 B2 4	Sight of digits 19(21) implies this M1 B1 for $1.92(1)\times10^9$ or 1 900 000 000 **Also FT** from M1 A0: e.g. B2 for 1.9×10^6, or B1 for $1.92(1)\times10^6$ or 1 900 000 OR from their incorrect value 2s.f and standard form, B2 both, B1 for either
10.(a) (i) Mid points 5, 15, 25, 35, 45 $\frac{5\times2 + 15\times20 + 25\times44 + 35\times28 + 45\times6}{100}$ 26.6 (ii) $10\,000 \div 26.6$ Either 375 or 376 (b) (i) 486, 518, 548 (ii) Explanation including implication of "smoothing out" or reducing impact of large or small numbers	B1 M1 m1 A1 M1 A1 B3 E1 10	 FT their midpoints, including bounds. Attempts Σfx FT their Σfx /100 Only accept 27 from working. 26 gets A0 FT from (i) Accept rounding up or down on FT FT from their first entry, +32 and +30. B2 for any 2 correct entries, B1 for a correct method towards at least 2 of the entries seen, or B1 for 1 correct entry, or B1 for sight of 4860, 5180 and 5480 Do not accept 'estimates number of books', nor 'rough average'

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Applications of Mathematics Unit 1 June 2011 Higher Tier		Comments Post conference version
11.(a) 28, 68, 80	B1	
(b) Correct cumulative frequency diagram, points plotted at bounds and joined by a curve or straight line	B2	FT only if cumulative in (a) B1 for points correct but not joined, OR B1 correct apart from 0.5 translation, OR B1 if one error in plotting but joined correctly
(c) Median (approx. 62.5 (mm))	B1	FT from their cumulative entries. Not cumulative means no FT
Intention to subtract readings from horizontal axis for vertical 60 & 20 (approx. 66 – approx. 57.5)	M1	
Interquartile range (approx 8.5(mm))	A1	
(d) General idea of what box – whisker should be	S1	Needs to show a box and whiskers
Range ends correctly indicated (46.5 and 74.5)	B1	
Median line correctly indicated (approx 62.5)	B1	FT their median
UQ and LQ correctly indicated (approx 66 and 57.5)	B1 10	FT their UQ and LQ readings
12.(a) $5\times12 + 4$	M1	
$12\times14 + 3$	M1	
64 **and** 171	A1	Both correct, maybe implied in later working
BMI = $\frac{171 \times 703}{64^2}$	M1	FT their 64 and 171 provided M1 award
= 29.3(4887...)	A1	Accept 29 from correct working
Overweight	B1	FT interpretation of their BMI provided at least M2 awarded previously
(b) Sight of $14s + p$ or equivalent	M1	
Sight of $12f + i$ or equivalent	M1	
(BMI =) $\frac{703(14s + p)}{(12f + i)^2}$	A2	Mark final answer A1 if correct formula seen before incorrect simplification, or A1 if 1 error in notation, or A1 for either numerator or denominator correct SC1 for $\frac{703(12s + p)}{(14f + i)^2}$
	10	
13. (a) Entries in frequency table: 30 and 27	B2	B1 for each correct entry
Histogram: 0 to 3 f.d. **8**, 9 to 15 f.d. **5**	B2	B1 for each correct bar
(b) Identifying that the answer is in the range >6 and <9	M1	Maybe shown on the histogram
Realising need ½ of the entry for $6<t\leq9$	M1	Maybe shown on the histogram
(x =) 7.5 (hours) or equivalent	A1 7	
14. (a)		<table><tr><td>Hr</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr><tr><td>Ht</td><td>3</td><td>4</td><td>6</td><td>9</td><td>12</td><td>14</td><td>15</td><td>14</td><td>12</td><td>9</td><td>6</td><td>4</td><td>3</td></tr></table>
Height of tide 12(m)	S1	Or 12(m) between highest and lowest plots
2 of the 3 answers to 1/12, 1/6 & 1/4 of 12 (1, 2 & 3)	B1	Or …. of 15 (1.25, 2.5 and 3.75)
Graph paper axes showing upto 15(m) and 24(hrs)	S1	
Suitable labels for the axes	S1	Units maybe omitted No further marks if not using the 3m low tide start or not using 12m tide
Heights of tides correct for at least 12 hours	B1	Shown in working or on the graph
Plots correct for the 24 hour period (joined or not)	B1	
(b) Method, e.g. use of graph or linear between 4 and 5 hours	M1	FT for M1 only if at least 3 marks awarded in (a)
An answer that rounds to13 (m)	A1	CAO. If units are given they must be corrct
(c) 12 hours	B1	Hours must be stated. An answer of 12 gets B0
Explanation, e.g. complete cycle	E1 10	SC1 for 'tide goes in and out twice in 24 hours'

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