WJEC GCSE MATHEMATICS (LINEAR)

MATHS



EXAM QUESTION PACK

PAPER 1 HIGHER TIER 4370 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

S16-4370-05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. THURSDAY, 26 May 2016

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **7**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**5**	
3.	**4**	
4.	**5**	
5.	**9**	
6.	**3**	
7.	**7**	
8.	**10**	
9.	**5**	
10.	**3**	
11.	**6**	
12.	**6**	
13.	**6**	
14.	**6**	
15.	**5**	
16.	**7**	
17.	**3**	
18.	**5**	
19.	**2**	
Total	**100**	

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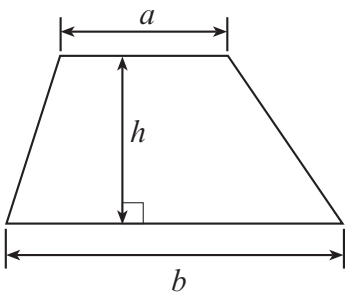
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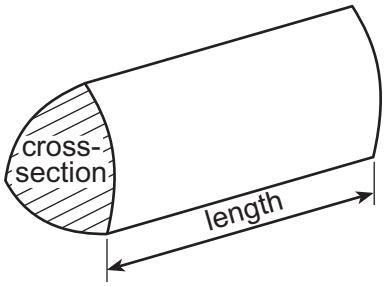
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Formula List

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

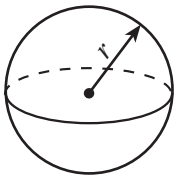


Volume of prism = area of cross-section × length



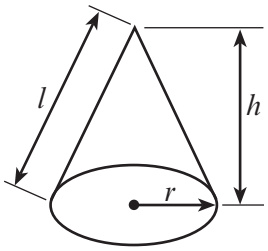
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

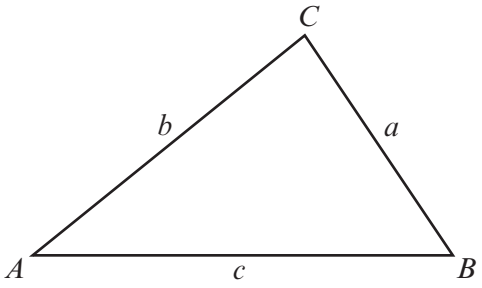


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1.

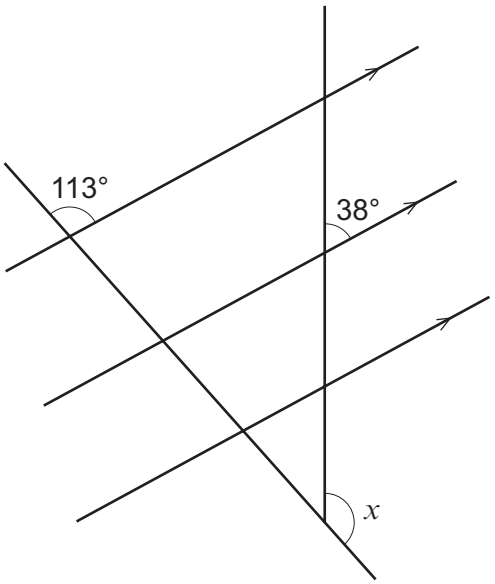


Diagram not drawn to scale

Calculate the size of angle x. [3]

.....

.....

.....

x = ... °

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2. Maria sells ribbon.

She has a 400 cm length of ribbon.

Maria cuts off $\frac{3}{10}$ of this ribbon and sells this piece to a customer.

She uses $\frac{2}{5}$ of the **remaining** ribbon herself to decorate a card.

Then, Maria cuts the ribbon that is left over into three equal lengths.

What is the length of each of these three remaining pieces of ribbon? [5]

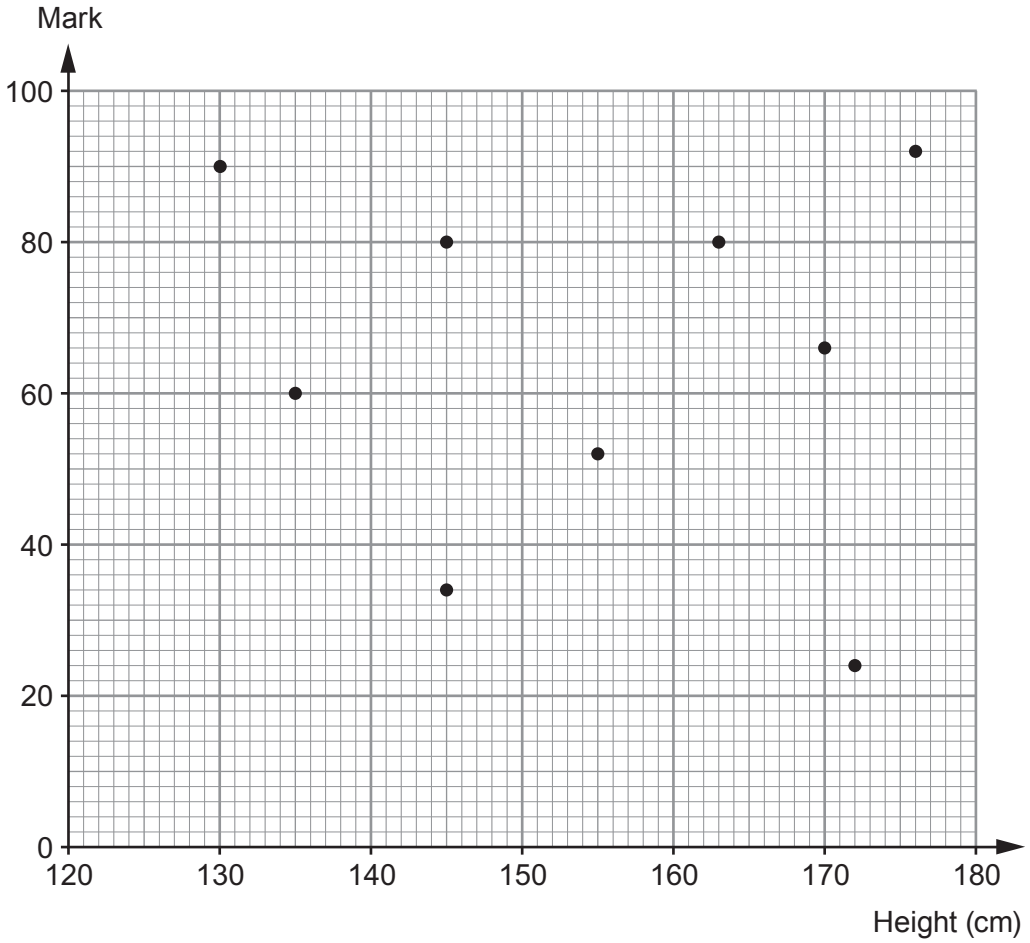
The length of each remaining piece of ribbon is ..... cm

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3. A number of students took an examination.
The heights of these students and the mark they each scored is shown in the scatter diagram below.



(a) Describe the correlation shown by the scatter diagram. [1]

.....

(b) Charlotte scored the same mark as Dewi.
Charlotte is taller than Dewi.
Henri is the tallest student in the class.
Dewi and Gareth are both the same height.

Complete the table. [3]

Name	Height (cm)	Mark
Dewi		
Charlotte		
Henri		
Gareth		

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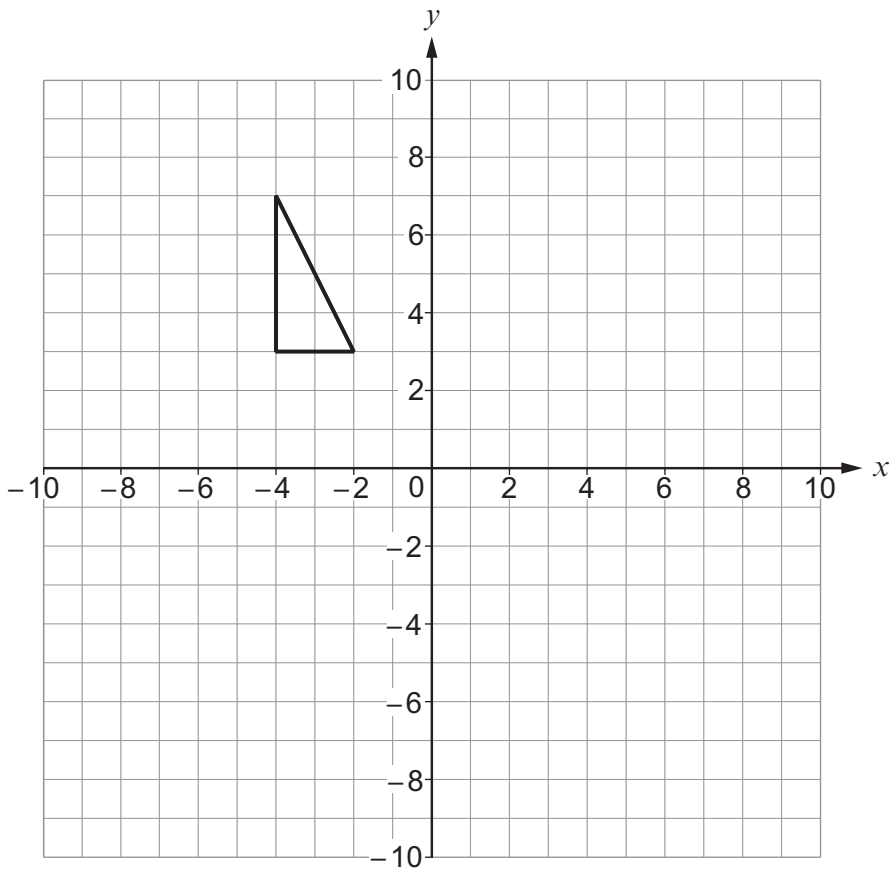
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Turn over.

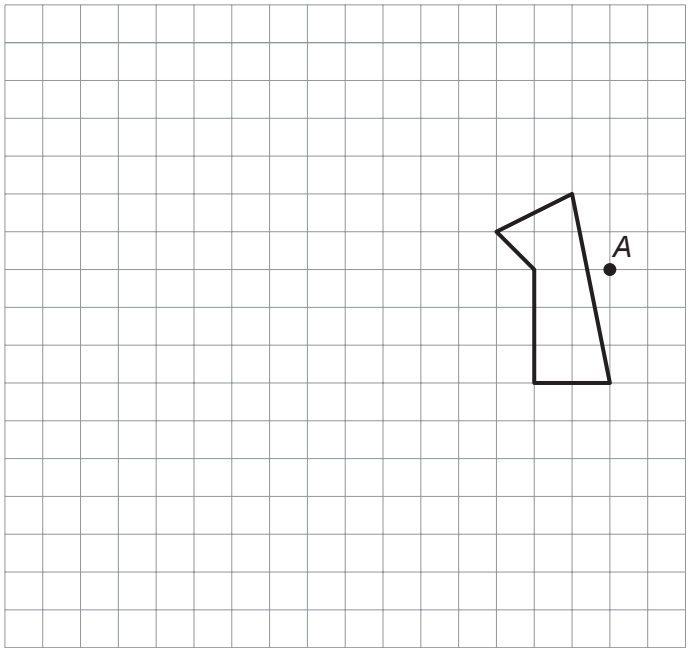
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4. *(a)* Draw a reflection of the triangle in the line $x = 1$. [2]



(b) Enlarge the shape shown by a scale factor of 2, using *A* as the centre of the enlargement. [3]



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5. *(a)* Find the nth term for each of the following sequences.

(i) 15, 21, 27, 33, 39, 45, … [2]

(ii) 30, 26, 22, 18, 14, 10, … [2]

(iii) –1, 2, 7, 14, 23, 34, 47, 62, … [2]

(b) The nth term of a sequence is $4n + 15$.
Write down the value of the first term in the sequence that is greater than 100. [3]

Value of $4n + 15$ is .....

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6. In answering this question you **must show all your construction arcs**.
Use a ruler and a pair of compasses to construct an angle of 45° at the midpoint of the straight line below.
Label your angle 45°. [3]

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

Our recommended daily intake of food is often given in calories.



A small bag of 20 almonds provides 160 calories.

It is recommended that Joseff's diet should contain 1920 calories per day.

Joseff eats a large portion of almonds one day.
It is 25% of his recommended daily calories.

How many almonds does he eat?
You must show all your working. [7]

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8. *(a)* Solve $5x - 65 = 3x - 17$. [3]

(b) Solve $\frac{x}{4} + 12 = 28$. [2]

(c) Expand $y(y + 8)$. [2]

(d) Factorise $3y^2 - y$. [1]

(e) Solve $10x + 8 < 42$. [2]

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9. *(a)* Express 396 as a product of prime numbers in index form. [3]

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(b) y^2 is the smallest square number that is a multiple of 396.

$$\ldots\ldots \times 396 = y^2$$

Write down the value of y. [2]

.....

.....

$y =$ .....

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10. *(a)* Express 8^{-1} as a fraction. [1]

.....

(b) Calculate $(3 \times 10^2) \times (1{\cdot}2 \times 10^3)$.
Give your answer in standard form. [1]

.....

.....

(c) Express $5{\cdot}4 \times 10^{-3}$ as a decimal. [1]

.....

11. Rearrange the following formulae to make w the subject.

(a) $t + 5w = h$ [2]

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(b) $aw + 3 = 4(bw + 5)$ [4]

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12. The probability that Daisy wears a bracelet is 0·7.
The probability that Daisy wears a bracelet **and** wears a necklace is 0·63.
For Daisy, wearing a bracelet and wearing a necklace are independent events.

(a) (i) Find the probability that Daisy wears a necklace. [2]

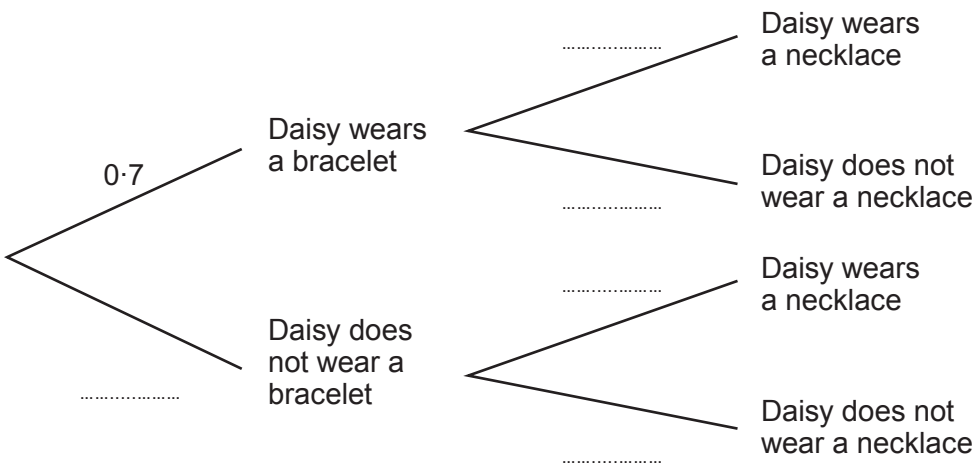
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Probability that Daisy wears a necklace = ...

(ii) Complete the tree diagram. [2]



(b) Find the probability that Daisy does not wear a bracelet **and** does not wear a necklace. [2]

.....

.....

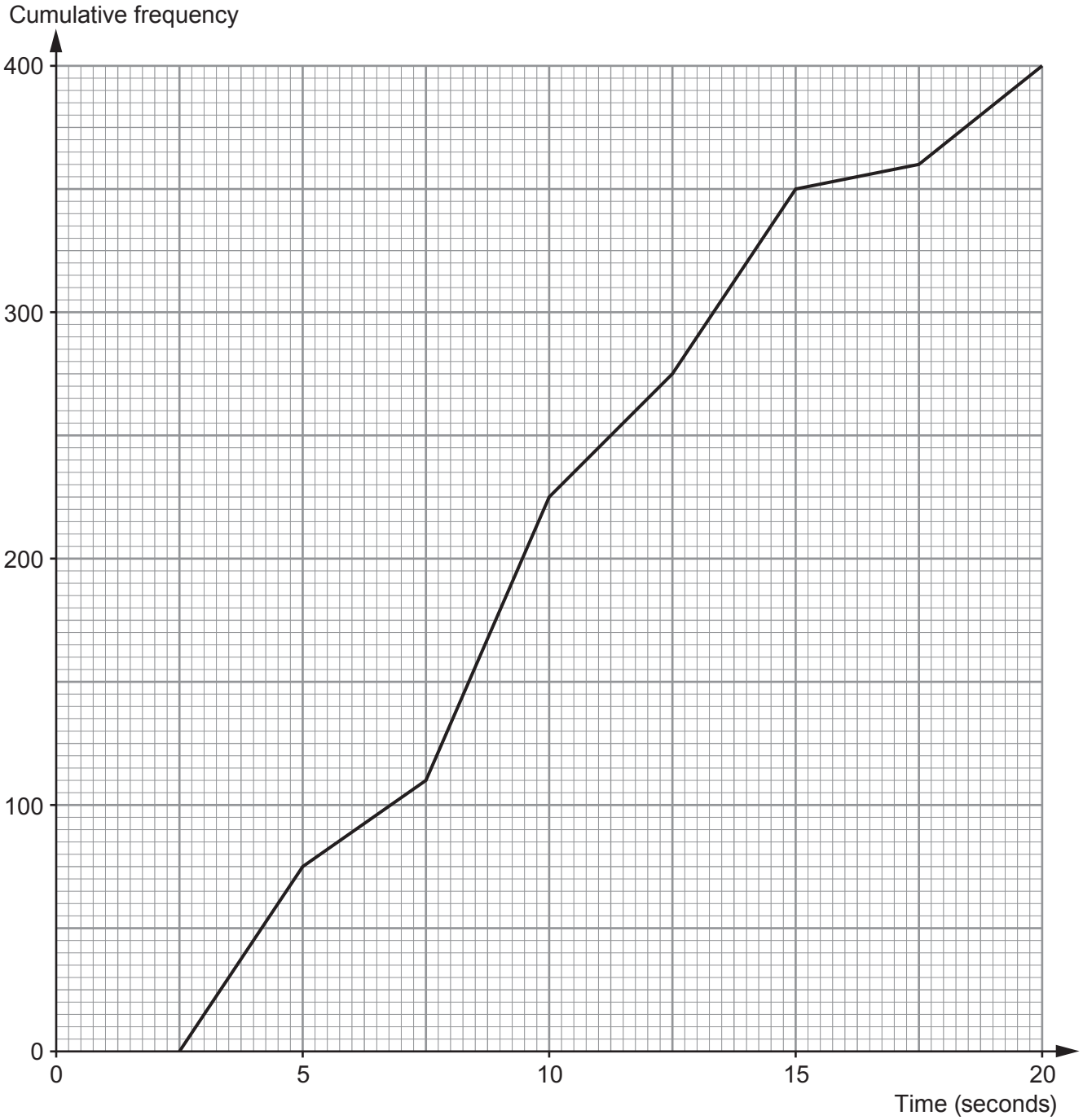
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13. The cumulative frequency diagram illustrates the times, in seconds, 400 people took to unwrap a box containing a new computer.



(a) How many of these people unwrapped the box in less than 10 seconds? [1]

.....

.....

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(b) What percentage of people took longer than 15 seconds to unwrap the box? [2]

.....

.....

.....

(c) Find the median and the interquartile range of the times taken to unwrap the box. [3]

.....

.....

.....

Median .....

Interquartile range .....

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14. Wilf thinks of a number, x.



His sister says that if Wilf subtracts 6 from his number and multiplies this new number by the number he first thought of, he will get an answer of –5.

Use this information to

- find a quadratic equation in the form $x^2 + ax + b = 0$, and
- hence solve the equation to find the possible values of x. [6]

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15. The straight lines *XAD* and *YAB* intersect at point *A*, which lies on the circumference of two circles.
Points *B*, *C* and *D* lie on the circumference of one circle.
Points *X* and *Y* lie on the circumference of the other circle.
The centre of one of the circles is at *O*.
$B\hat{C}D = w°$.

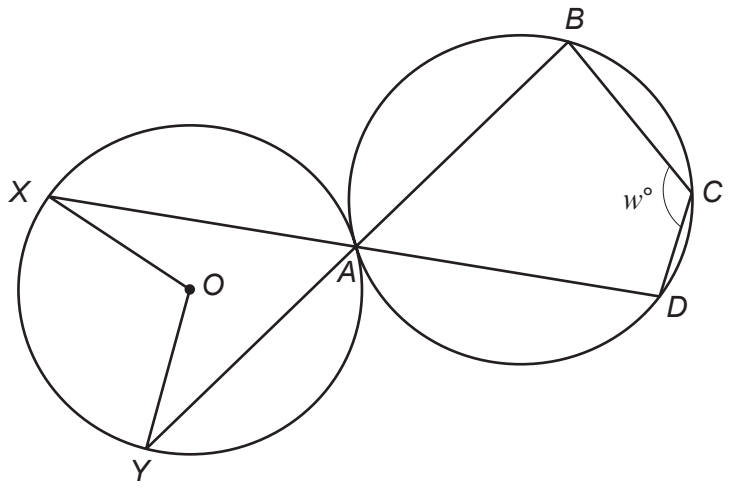


Diagram not drawn to scale

Write an expression for $X\hat{O}Y$ in terms of w.
You must show all the stages of your work and give reasons at each stage. [5]

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16. *(a)* Express $\frac{4}{2x-3} + \frac{8}{x+6}$ as a single fraction in its simplest form. [3]

(b) Simplify $\frac{9x^2-25}{6x+10}$. [4]

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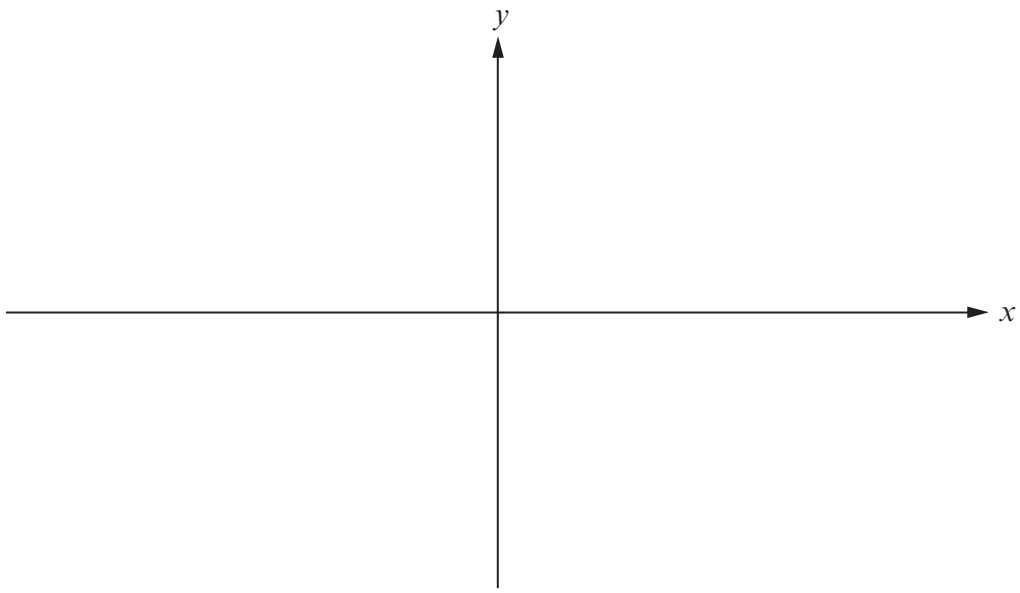
17. Evaluate $\left(\sqrt{50}-3\sqrt{2}\right)^2$. [3]

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18. *(a)* Use the axes below to sketch $y = x^2 - 9$.
Mark clearly the coordinates of any point where this curve meets an axis. [3]



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(b) Mari is asked to sketch $y = (x + 2)^2 - 9$.
Describe how Mari could use your sketch from *(a)* to sketch this curve. [2]

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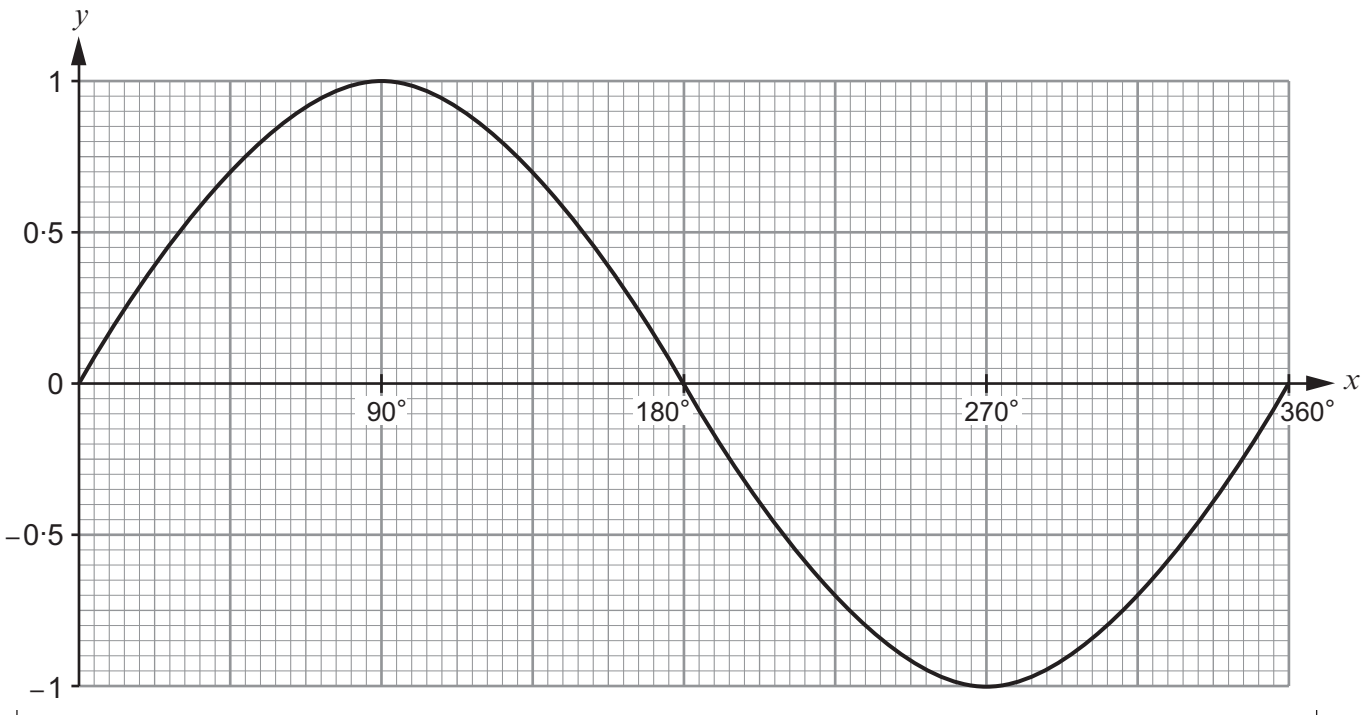
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19. The diagram below shows the graph of $y = \sin x$ for values of x from 0° to 360°.



Find, as accurately as possible, all solutions of the following equation in the range 0° to 360°.

[2]

$$\sin x = -0{\cdot}7$$

.....

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END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINEAR PAPER 1
HIGHER TIER

4370/05

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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 Mathematics - Linear Paper 1 Higher Tier
Summer 2016 Mark Scheme

<table>
<tr><th>Summer 2016 Linear Paper 1
Higher Tier</th><th>Marks</th><th>Comments</th></tr>
<tr><td>1. 105(°)</td><td>B3</td><td>Allow even if contradicted on the diagram

B2 for sight of 75(°) (including as a final response or incorrectly placed on the diagram)
B2 for sight of 105(°) in working not as an answer or contradicted as a final response in the answer space
B2 for working:
38 + 67 or 180 – 75, or
the intention of either calculation, allowing missing brackets
180 – (180 – 38 - 67) (= 38 + 67) or
180 – (180 – 38 – (180 – 113) (= 180 – 75), or

OR

B1 for any further unambiguous correct angle indicated on the diagram: 113(°), 67(°), 38(°) or 142(°), or
B1 for working: 180 – 38 – 67 or 113 – 38 or
180 – 38 –(180 -113), or equivalent</td></tr>
<tr><td>2. 400×7÷10 or 400 - 400×3÷10 or equivalent
280(cm)

280 ×⅗ or 280 – 280×2÷5 or 280 – 112
168(cm)

56 (cm)</td><td>M1
A1

M1
A1

B1</td><td>
May be implied in further calculation
Incorrect working leading to 280 is M0 A0, e.g.
3/10 × 400 + 2/5 × 400 = 120 + 160 = 280

FT 'their 280' provided < 400
May be implied in further calculation

FT 'their 168' ÷ 3 correctly evaluated (rounded or truncated) provided either
at least M1 previously awarded or
'their two stages of calculations' previously attempted
(However if 3/10 & 2/5 used throughout SC marks may be awarded instead of possible B1 if a higher mark can be awarded)

For consistent use of 3/10 and 2/5 award:
SC3 for an answer of 16(cm from 400 × 3/10 × 2/5 ÷3), or
SC2 for workings equivalent to 400 × 3/10 × 2/5 ÷3 (may be in stages), or
SC1 for an answer of 48(cm from 400 × 3/10 × 2/5)</td></tr>
<tr><td>3(a) Descriptions of no correlation, e.g. 'no relationship', 'no correlation', 'none', 'no connection'</td><td>B1</td><td>Do not accept '(all) scattered (about)', or 'random', or 'neutral', 'no pattern'
Allow if a correct response is given with one of the phrases listed above. Do not allow a correct response with an incorrect response, e.g. 'none but slightly positive'</td></tr>
<tr><td>3(b)
<table><tr><th>Name</th><th>Height (cm)</th><th>Mark</th></tr><tr><td>Dewi</td><td>145</td><td>80</td></tr><tr><td>Charlotte</td><td>163</td><td>80</td></tr><tr><td>Henri</td><td>176</td><td>92</td></tr><tr><td>Gareth</td><td>145</td><td>34</td></tr></table></td><td>B3</td><td>All entries correct
Accept mark entries as a fraction of 100, or written as a percentage

B2 for any 5, 6 or 7 entries correct, or if the correct entries in the table but they are in reversed columns, OR

B1 for any 3 or 4 entries correct, or for any 5, 6 or 7 reversed entries in the table</td></tr>
</table>

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
4(a) Correct reflection	B2	B1 for the sight of the line x = 1, or a reflection in any vertical line or in the line y = 1 B0 if more than one triangle drawn, unless all are reflections in a vertical line
4(b) Correct enlargement Correct position	B2 B1	B1 for any 2 adjacent lines or any 3 points correct in appropriate positions Intention of correct placement, i.e. with appropriate rays seen, or correct positioning of at least two vertices *Penalise consistent incorrect scale factor -1*
5(a)(i) 6n + 9	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of 6n
5(a)(ii) -4n + 34 or 34 – 4n	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of -4n or '+34'
5(a)(iii) n^2 - 2	B2	Condone change of variable, letter and/or case, for B2 or B1 B1 for sight of n^2 (that is $1n^2$) or showing second difference of 2 at least twice
5(b) 103	B3	**Look at the answer space first for the candidate's response** Only award B3 if the candidate is indicating 103 as their response Accept 'n = 22 gives a <u>value</u> of 103' in the answer space, or in working and not contradicted in the answer space B2 for n > 85/4, or **response** (n =) 22 (sight of 103 is not required), or for trial n=21 with 99 seen, or for trial n=23 with 107 seen. Trial or selection of (n=) 22 **and** 103 in working, without stating 103 as the answer (e.g. in the answer space), is awarded B2 OR B1 for sight of 4n + 15 > 100, or for sight of (n =) 21.25 or (n=) 85/4, or for at least 2 trials of n ≥ 10 with terms calculated correctly, or for any 2 of the values 59, 63, 67, 71, 75, 79, 83, 87, 91, 95, 99 seen within a sequence
6. Accurate perpendicular bisector constructed with all necessary arcs Accurate bisection with evidence of all necessary arcs and an angle 45° (±2°)	B1 B2	***No marks if no arcs or spurious arcs*** Accept 1 pair of arcs with a correct midpoint Accept a construction of 90° with arcs from a measured midpoint Tolerance is ±2mm and ±2° B1 for pair of arcs on appropriate lines with an attempt at the next step, but some inaccuracy

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
7. (% of daily calories 25% of 1920 =) 480 (calories)	B1	
(Number of bags needed) 480÷160	M1	FT 'their 480' provided attempt at 1920×25÷100 or 1920÷4 or equivalent is seen or implied
(=) 3	A1	May be implied in later working
(Number of almonds eaten 3 × 20) ×20	m1	
60 (almonds)	A1	FT 'their 3'×20 evaluated provided attempt to find 25% of 1920 and M1, m1 previously awarded
		Alternatives ***(% of daily calories 25% of 1920 =) 480 (calories) B1*** ***160÷20 M1*** ***= 8 (calories per almond) A1*** *(May be implied in later working)* ***(Number of almonds) 480÷8 m1*** *(FT 'their 25% of 1920'÷ 'their 160÷20')* ***60 (almonds) A1*** *(FT provided attempt to find 25% of 1920 and M1, m1 previously awarded)* ***or*** ***(Number of bags in a full daily allowance is)*** ***1920÷160 M1*** ***= 12 (bags) A1*** *(May be implied in later working)* ***(Number of bags 25% of allowance is ¼×12=) 3 (bags) B1*** *(FT 'their ¼ × 1920÷160 provided M1 previously awarded)* ***(Number of almonds eaten) 3 × 20 m1*** *(FT 'their ¼ × 1920÷160'×20 provided M1 previously awarded)* *(Previous B1 & m1 calculations may be seen in either order)* ***60 (almonds) A1*** *(FT provided attempt to find 25% of 1920÷160 and M1, m1 previously awarded)* ***or*** ***20 (almonds) with 160 (calories) used as a ratio M1*** *e.g. sight of 40 almonds is 320 calories or similar* ***Use of ratio or multiples that lead to 1920 (calories) m1*** ***240 (almonds is 1920 calories) A1*** ***(Number of almonds is) ¼ × 240 M1*** *(FT provided M1, m1 previously awarded)* ***60 (almonds) A1*** *(FT provided M1, m1 previously awarded AND attempt to find the number of almonds in 1920 calories)* **If no marks, and no incorrect logic seen, then award SC2 for an answer of 60 almonds**

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
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.
8(a) $5x - 3x = 65 - 17$ $2x = 48$ $x = 24$	B1 B1 B1	FT until 2nd error, then stop marking Must be simplified if possible for this final B1 mark
8(b) $x/4 = 28 - 12$ or $x/4 = 16$ or $x + 12\times4 = 28\times4$ $x = 64$	M1 A1	 Mark final answer *Accept embedded answer, e.g. 64/4 + 12 = 28*
8(c) $y^2 + 8y$	B2	y×y must be written as y^2 & 8×y as 8y for B2 B1 for y×y + 8×y, or B1 for 1 correct term, e.g. 2y + **8y** = 10y or y + **8y** = 9y BUT do not accept from incorrect working, e.g. B0 for 'y + 8 = 8y' Mark final answer, e.g. B1 only for '$y^2 + 8y = 8y^3$'
8(d) $y(3y - 1)$	B1	Mark final answer
8(e) $10x < 34$ or $10x < 42 - 8$ $x < 34/10$ or $x < 3.4$ or $x < 3^4/_{10}$ or $x < 3^2/_5$ or equivalent	B1 B1	Do not accept '=' FT from 1 error only. ISW *If '=' used but replaced by '<' to give final correct answer, allow B2* *Note: 10x < 42 + 8 must lead to x < 5 to be awarded B0,B1*
9(a) Method with at least 2 correct prime factors Sight of correct factors (2, 2, 3, 3, 11) $2^2 \times 3^2 \times 11$ or $2^2 . 3^2 . 11$	M1 A1 B1	2 correct primes before 2nd error Ignore 1s seen FT their factors (with at least one index >1 used). Do not ignore 1s.
9(b) (y =) 66	B2	FT from (a), provided equivalent difficulty B1 for 2×3×11 or for 4356 or for 11 in the box or answer space
10(a) 1/8	B1	
10(b) 3.6×10^5	B1	
10(c) 0.0054	B1	

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
11(a) $5w = h - t$ $w = \frac{h-t}{5}$ or equivalent	B1 B1	FT from $5w = h + t$ or similar 1 error made *Award B1, B0 for an answer of $w = h – t \div 5$*
11(b) $aw + 3 = 4bw + 20$ $aw - 4bw = 20 – 3$ OR $3 – 20 = 4bw – aw$ $w(a – 4b) = 17$ OR $-17 = w(4b – a)$ $w = \frac{17}{a – 4b}$ OR $\frac{-17}{4b - a} = w$	B1 B1 B1 B1	Includes correct expansion FT until 2nd error Mark final answer. Do not accept a numerator 20 - 3
12(a)(i) Using $0.7 \times \ldots = 0.63$ or sight of $0.63 \div 0.7$ or $0.63/0.7$ P(necklace) = 0.9 or equivalent	M1 A1	
12(a)(ii) Tree completed correctly (0.3, 0.9, 0.1, 0.9, 0.1 on appropriate branches)	B2	FT their '0.9', this could be 0.63 and 0.37 on second pairs of branches B1 for 0.3 with at least one other pair of branches total of 1
12(b) 0.3×0.1 $= 0.03$	M1 A1	FT attempt to multiply appropriate probabilities, provided no probability >1 FT for correct evaluation, provided not >1
13(a) 225 (people)	B1	Allow 224 (people)
13(b) $(100 \times) 50 \div 400$ or equivalent 12½(%) or 12.5(%)	M1 A1	 *If no marks allow SC1 for an answer of 87.5(%), i.e. percentage less than 15 seconds*
13(c) (Median) Answers in the range 9.4 to 9.5 (seconds) (Interquartile range) 13.25 to 13.35 - 6.75 to 6.8 6.45 to 6.6 (seconds)	B1 M1 A1	 *Check working, do not assume correct calculation from sight of an answer in the given range*
14. Sight of $x(x – 6) = -5$ $x^2 – 6x + 5 = 0$ $(x – 1)(x – 5)$ $(= 0)$ $x = 1$ AND $x = 5$ or equivalent	 B2 B1 M2 A1	Allow choice of a variable other than x Accept intention of brackets (invisible but used later) B1 for sight of $x(x – 6)$ or $x^2 – 6x$ Implies previous B2. Must be an equation Accept as an expression. *See* below.* M1 for $(x \ldots 1)(x \ldots 5)$ FT from their pair of brackets, equivalent level of difficulty Do not FT from incorrect working that leads to $(x – 1)(x – 5)$ If M0 A0, allow SC1 for answers 1 **and** 5 from trial & improvement or inspection *If formula used, then M1 for correct substitution (allowing 1 slip in substitution), M1 for simplification of 'b^2-4ac' to 16, finally A1 for correct solutions simplified but surds not required* **For final M2 & A1, FT from their quadratic equation (or expression) provided equivalent difficulty and has been derived from '... = -5'.*

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
15. DÂB = 180(°) – w(°), stated or indicated on the diagram	B1	Allow w(°) = 180(°) - DÂB
Cyclic quadrilateral (opposite angles sum is 180°)	E1	Depends on previous B1
XÂY = DÂB =180(°) – w(°), stated or indicated, OR a statement 'vertically opposite angles' or 'equal angles with intersecting lines'	B1	Accept indication by arcs, or both angles indicated by the same 'value' or expression.
XÔY = 2(180(°) – w(°)) or XÔY = 360(°) – 2w(°)	B1	Implies award of previous B1 ISW working towards reflex XÔY Do not accept 2 × 180(°) – w(°) (with missing brackets) or equivalent FT 'their angle at the centre' being indicated as twice 'their angle at the circumference' provided equivalent level of difficulty, i.e. at least 2 terms multiplied by 2 involved with any brackets required shown Only accept 'reflex XÔY = 2w(°)' if stated as reflex without contradiction on the diagram, or 2w(°) indicated as reflex XÔY on the diagram
Angle at centre is twice angle at circumference	E1	Allow FT from a response of 2 × 180(°) – w(°) (missing brackets) or where FT has been similar giving B0, or correct rearrangement of the correct response, otherwise depends on previous B1 *Award B3 for a correct unambiguous XÔY without working, or from correct working.*
16(a) 4(x+6) + 8(2x-3) as a <u>numerator</u>	M1	
(2x-3)(x+6) as a <u>denominator</u>	M1	
20x / (2x-3)(x+6)	A1	CAO, mark final answer If (2x-3)(x+6) expanded, must be correct (Note: $(2x -3)(x+6) = 2x^2 + 9x – 18$) *If no marks then award SC1 for sight of* *4(x+6) + 8(2x-3) = 20x in working*
16(b) (3x + 5)(3x - 5)	B2	B1 for (3x … 5)(3x … 5) including being written as either $(3x – 5)^2$ or $(3x + 5)^2$
2(3x + 5)	B1	
(3x – 5)/2	B1	FT provided no more than 1 previous error and provided simplification required. Mark final answer. Accept 1.5x – 2.5 Award B4 for sight of a correct answer
17. $(\sqrt{(2×25)} - 3\sqrt{2})^2$ or $(\sqrt{(2×5×5)} - 3\sqrt{2})^2$ or sight of $\sqrt{50} = 5\sqrt{2}$ in working	M1	OR M1 50 - $3\sqrt{50}\sqrt{2}$ -3 $\sqrt{50}\sqrt{2}$ + 18 any 3 terms correct (accept as terms given in table)
$(5\sqrt{2} - 3\sqrt{2})^2$ $(= (2\sqrt{2})^2)$	m1	m1 50 - 30 -30 + 18 any 3 terms correct or 50 - 60 + 18 with -60 correct and 1 other term (accept as terms given in table)
8	A1	CAO A1 8

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Summer 2016 Linear Paper 1 Higher Tie	Marks	Comments
18(a) Correct sketch in 4 quadrants with -9 on the y-axis AND 3 & -3 on the x-axis	B3	B2 for an appropriate sketch in 4 quadrants with <u>either</u> -9 indicated (allow shown between -8 & -10) on the y-axis <u>OR</u> 3 & -3 indicated on the x-axis (ignore additional incorrect points indicated), or B2 for sketch only in 2 quadrants with -9 indicated on the y-axis AND -3 or 3 indicated on the x-axis OR B1 for an appropriate sketch in 4 quadrants without points indicated or with incorrect points indicated, or B1 for sketch only in 1 quadrant with -9 indicated (allow shown between -8 & -10) on the y-axis AND -3 or 3 indicated on the x-axis , or B1 for sketch only in 2 quadrants with -9 indicated on the y-axis *Penalise -1 if 'points' are joined with straight lines*
18(b) Move horizontal (Translate) to the left 2	B2	Alone, with no other movements Allow descriptions such as 'move to the left 2', or 'move left along x-axis 2', 'shift -2 horizontally' B1 for move (translate) horizontally (left or right), allow use of descriptions such as 'sideways' or 'along x-axis' Allow B1 translation shown graphically, provided it is not derived from plotted points with -5 and 1 indicated on the x-axis
19. **225(°)** or **315(°)**	B1	Allow an answer in the range 224(°) to **225(°)** or **315(°)** to 316(°) inclusive. (*Answers are actually 224.4(°) or 315.6(°) but, for a non calculator paper, such accuracy would be suspicious)*
The other angle, with no other values	B1	FT 540 – first answer, however only FT for reflex angles and be a unique second angle Accept embedded answers

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

S15-4370-05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. THURSDAY, 21 May 2015

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

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**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**5**	
3.	**6**	
4.	**2**	
5.	**7**	
6.	**4**	
7.	**3**	
8.	**2**	
9.	**6**	
10.	**3**	
11.	**3**	
12.	**7**	
13.	**7**	
14.	**5**	
15.	**8**	
16.	**8**	
17.	**5**	
18.	**8**	
19.	**6**	
Total	**100**	

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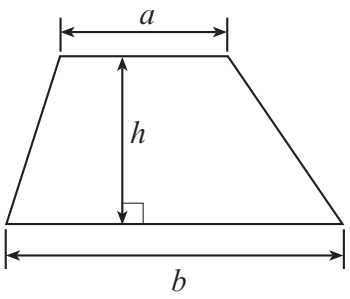
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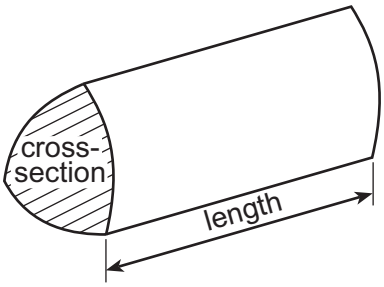
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Formula List

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

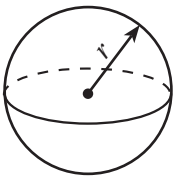


Volume of prism = area of cross-section × length



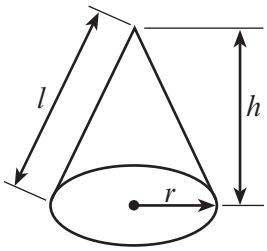
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

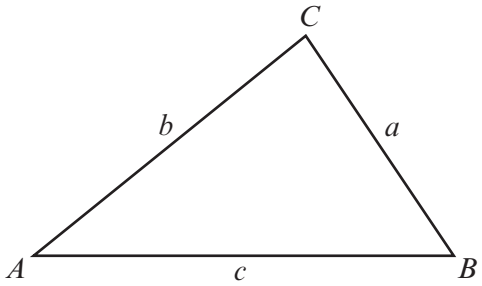


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1. Use the exchange rate **£1 = 1.52 US dollars** to answer the following questions.

(a) Gareth exchanges £300 into US dollars.
How many US dollars will he receive? [2]

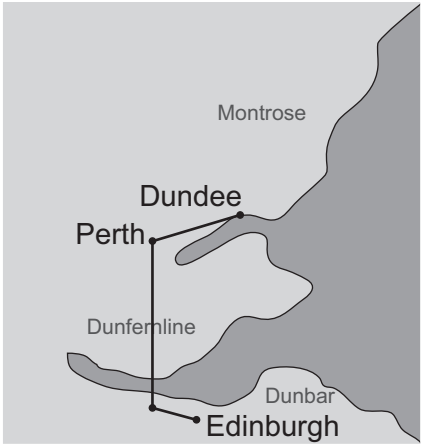
(b) Adrienne wants to exchange 585 US dollars into pounds (£).
Estimate how many pounds Adrienne is likely to receive.
You must show your working. [3]

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2. The map below shows a route from Edinburgh to Dundee.



The route from Edinburgh to Dundee is approximately 4 cm on the map.
The actual journey is approximately 100 kilometres.

(a) Calculate the scale of the map, giving your answer in the form **1** : ..... [2]

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(b) The journey from Edinburgh to Dundee takes 2 hours 30 minutes by car.
Calculate the average speed of this journey.
Give your answer in kilometres per hour. [3]

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3.

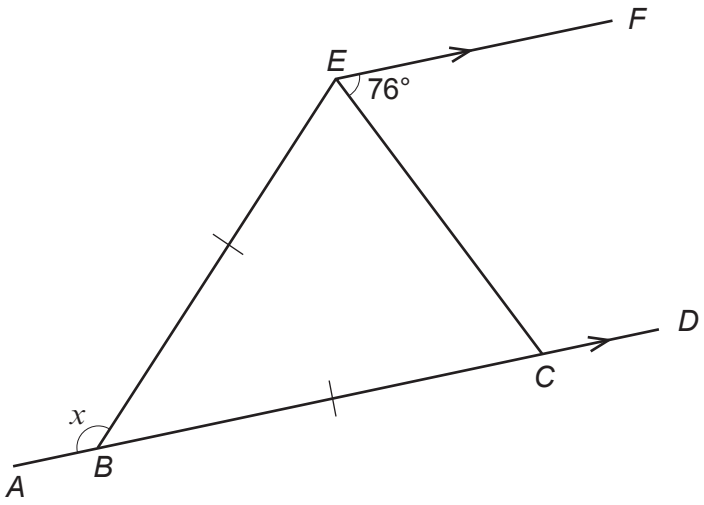


Diagram not drawn to scale

ABCD is a straight line.
EF is parallel to *AD*.
BE = *BC*.

Calculate the size of angle x.
You must give a reason for each step of your answer.
You must show all your working. [6]

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4. The bearing of Ryeton from Cwm is 235°.
Write down the bearing of Cwm from Ryeton. [2]



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

In a factory there are two machines.
Machine A makes plastic spoons and Machine B makes plastic forks.
Both machines work at a steady rate.

Machine A makes **180** plastic spoons per hour.



Machine B makes **240** plastic forks per hour.



Both machines start their production on a Monday morning at 9 a.m.
Both machines are stopped for maintenance after 450 spoons have been produced.
Calculate

- the time at which the machines were stopped for maintenance
- the number of forks produced between 9 a.m. and the time the machines were stopped for maintenance. [7]

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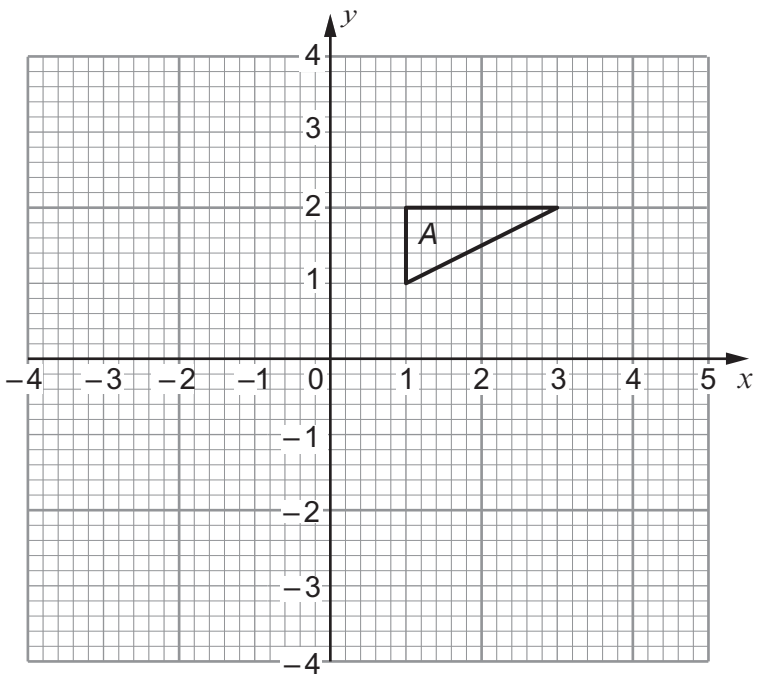
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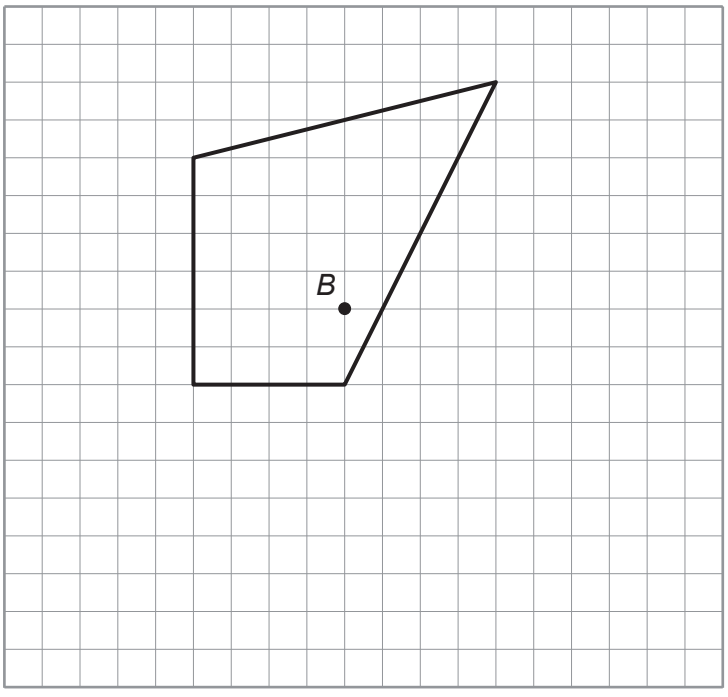
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6. *(a)* Rotate triangle *A* through 90° anticlockwise about the point (2, –1). [2]



(b) Using the point *B* as the centre, enlarge the quadrilateral by a scale factor of $\frac{1}{2}$. [2]



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7. The diagram below shows part of a regular polygon.



Diagram not drawn to scale

How many sides does this regular polygon have altogether? [3]

8. Megan has a fair 6-sided dice.



She throws the dice twice.
Calculate the probability that she throws a 4 both times. [2]

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9. *(a)* Find the integer that satisfies the equation $x^3 - 2x = 21$.
You must show all your working. [2]

(b) Solve $y^2 = 49$.
You must write down all possible solutions. [2]

(c) Expand $x^3(3x - 5)$. [2]

10. A mixed number is a whole number with a fraction.

$4\frac{3}{4}$ and $2\frac{3}{8}$ are mixed numbers.

Evaluate $4\frac{3}{4} + 2\frac{3}{8}$.

Express your answer as a mixed number in its simplest form. [3]

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11. A hollow cylinder is made with an internal radius of 4 cm and an internal height of 10 cm.

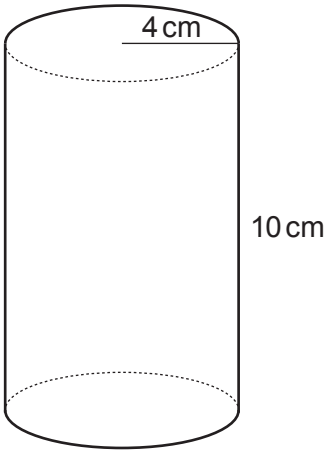


Diagram not drawn to scale

Carwyn says

'This cylinder holds approximately 5 litres of liquid.'

By estimating π as 3, show whether Carwyn is correct or not.

You must show your working and give a reason for your answer. [3]

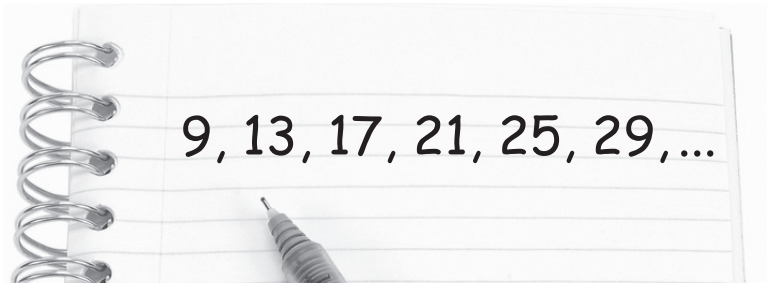
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12. Dewi writes the first 6 numbers of a sequence on a notepad.



(a) (i) Write down the nth term of Dewi's sequence. [2]

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(ii) Carys says that 149 is in Dewi's sequence.
Is Carys correct?
You must explain your answer. [1]

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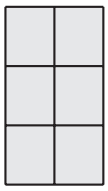
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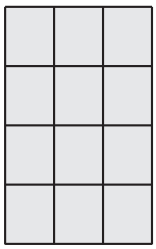
(b) Val works for WindPane, a company that makes rectangular windows using small panes of glass.
All the small panes of glass are the same size.

Val has drawn patterns of windows and the panes of glass, as shown below.

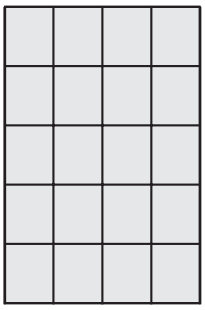
Pattern 1



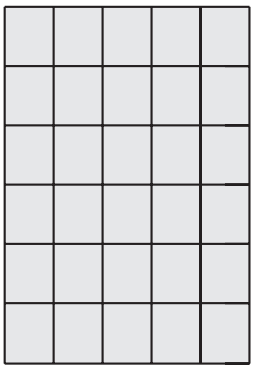
Pattern 2



Pattern 3



Pattern 4



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(i) Imran says that there would be 110 panes in Pattern 8.
Is Imran correct?
You must explain your answer. [2]

(ii) Val says that Pattern n contains $n^2 + 3n + 2$ panes of glass.
Is Val correct?
You must show your working and justify your answer. [2]

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13. The grouped frequency table shows information about the weekly wages of 160 office workers.

Weekly wage, £x	Frequency
$100 < x \leqslant 200$	10
$200 < x \leqslant 300$	22
$300 < x \leqslant 400$	46
$400 < x \leqslant 500$	54
$500 < x \leqslant 600$	18
$600 < x \leqslant 700$	10

(a) Complete the following cumulative frequency table. [1]

Weekly wage, £x	Cumulative frequency
$x \leqslant 100$	0
$x \leqslant 200$	10
$x \leqslant 300$	
$x \leqslant 400$	
$x \leqslant 500$	
$x \leqslant 600$	
$x \leqslant 700$	

(b) Use the graph paper opposite to draw a cumulative frequency diagram for the weekly wages of the 160 office workers. [3]

(c) Calculate an estimate for the interquartile range. [2]

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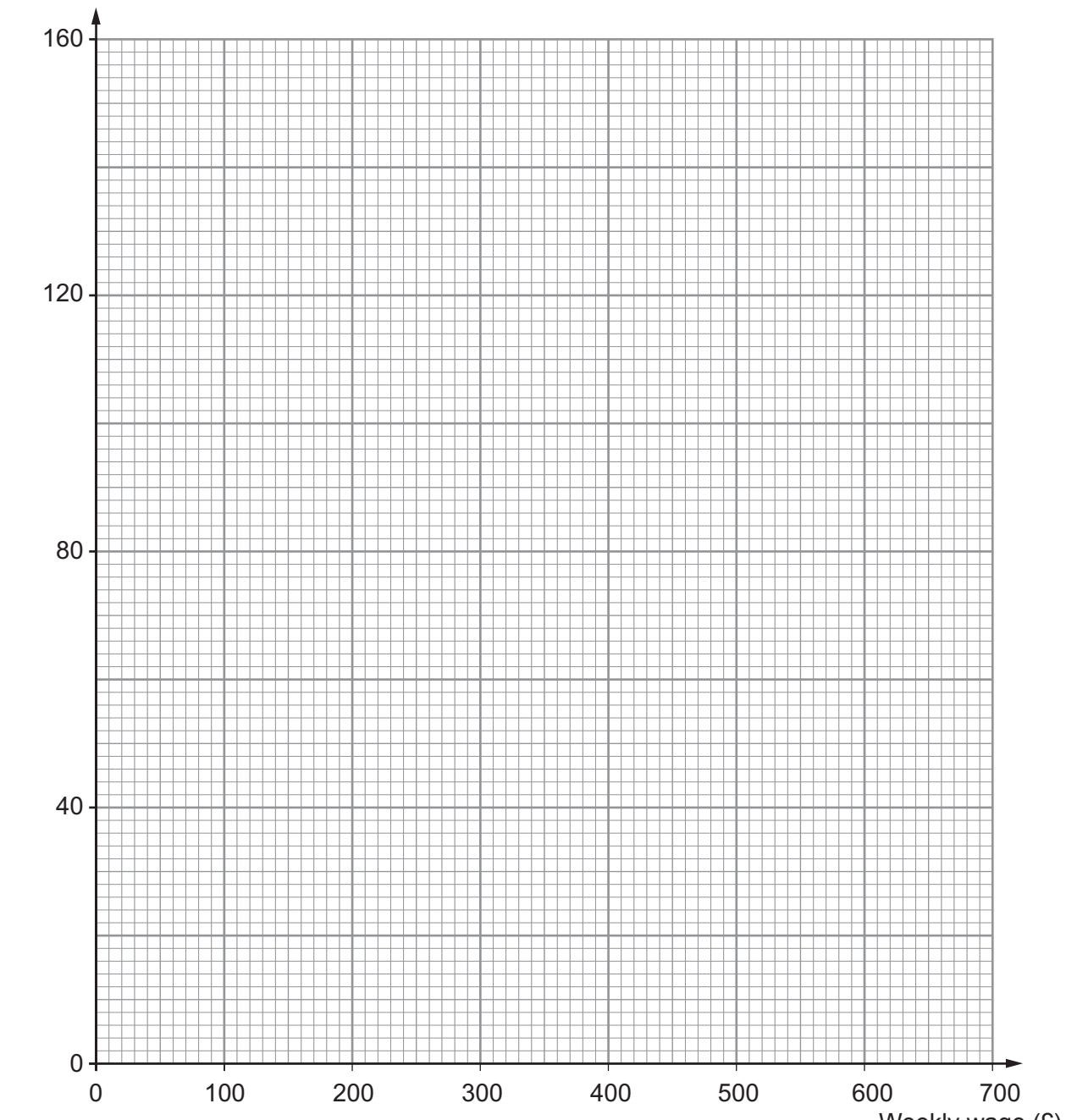
(d) Estimate the number of workers with a weekly wage of more than £520. [1]

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14. *(a)* Solve $x^2 + 2x - 15 = 0$. [3]

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(b) Simplify $3a^3 b^5 \times 4a^6 b$. [2]

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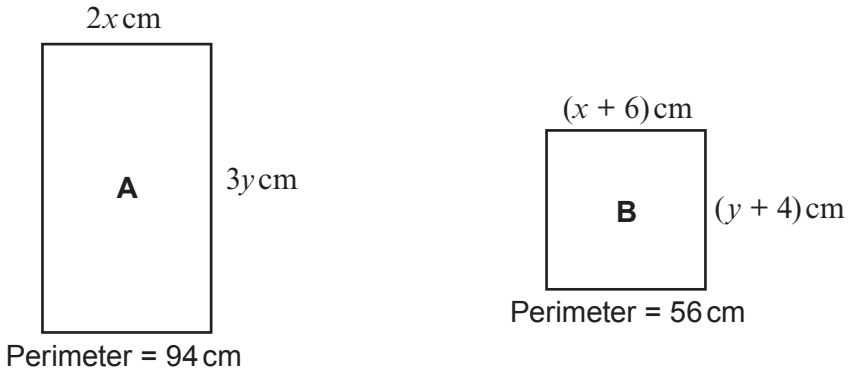
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15. The rectangles **A** and **B** have perimeters of 94 cm and 56 cm as shown below.



Diagrams not drawn to scale

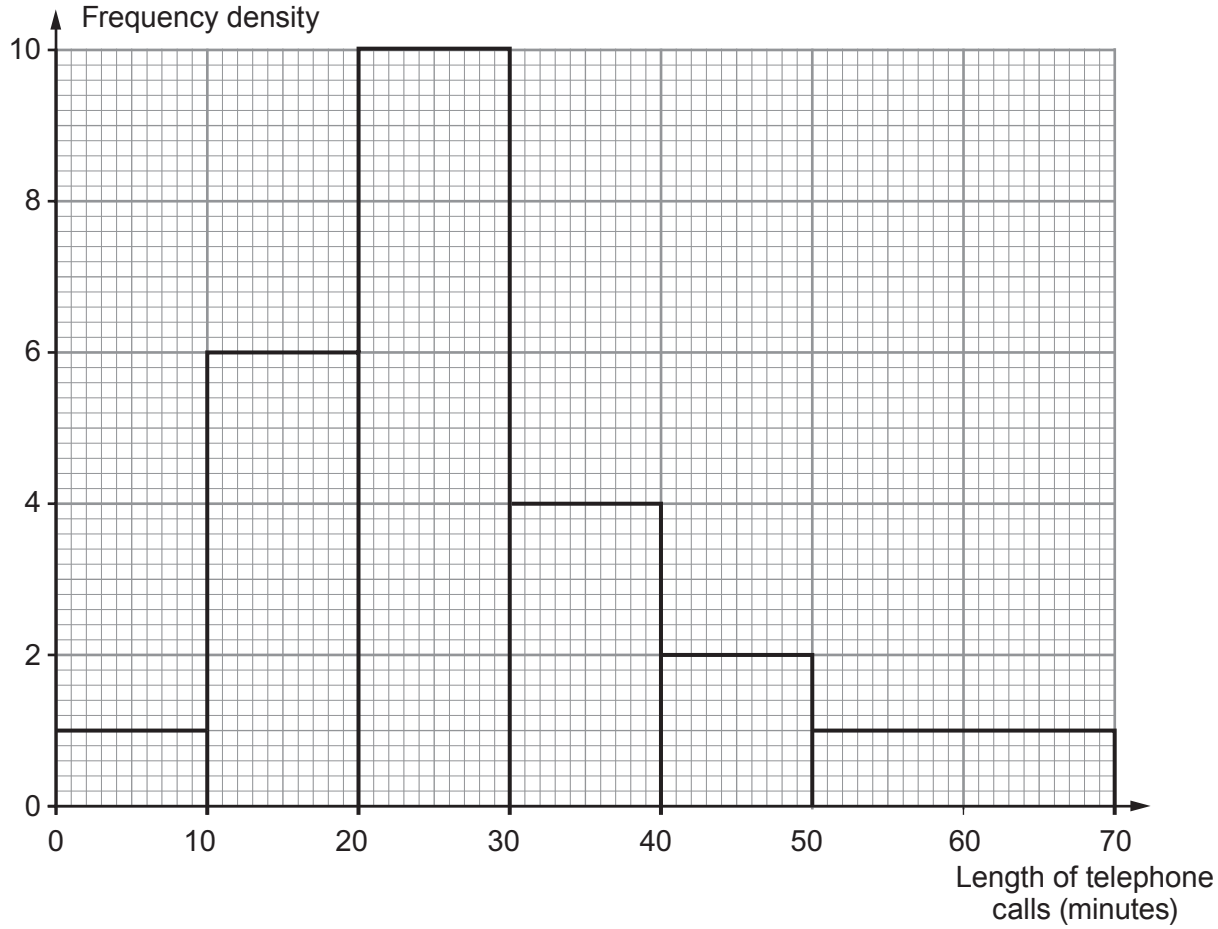
Use an algebraic method to calculate the area of each rectangle. [8]

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16. The histogram illustrates the lengths of telephone calls made to a computer helpline during one Friday evening.



(a) Calculate how many telephone calls were made to the computer helpline during the Friday evening. [3]

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(b) Calculate an estimate of the percentage of telephone calls that lasted longer than $\frac{3}{4}$ of an hour. [2]

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(c) Estimate the median length of a telephone call made to the computer helpline during the Friday evening.
Give your answer correct to 1 decimal place. [3]

17. *(a)* Express $0\dot{3}4\dot{6}$ as a fraction. [2]

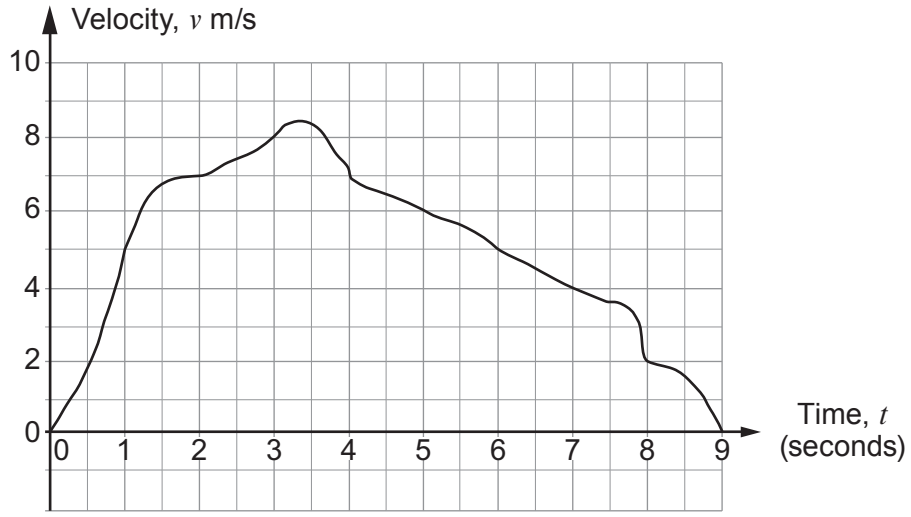
(b) Simplify $(7 - 5\sqrt{2})^2$ and state whether your answer is rational or irrational. [3]

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18. A scientist records the velocity, v m/s, of a particle from time $t = 0$ to $t = 9$ seconds. His results are shown in the graph below.



(a) Use the graph to estimate the acceleration of the particle at $t = 1{\cdot}5$. Give your answer to one decimal place. [3]

.....

.....

(b) (i) Use the trapezium rule, with the ordinates $t = 0$, $t = 3$, $t = 6$ and $t = 9$ to estimate the distance the particle travelled during the experiment. [4]

.....

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(ii) By considering the graph given, state how you would improve on the estimate for the distance the particle travelled during the experiment. [1]

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19. Twenty raffle tickets are sold.
The tickets sold are numbered from 1 to 20.
The raffle tickets are placed in a drum for a draw.
Two raffle tickets are selected at random, one ticket at a time, and not replaced in the drum.

(a) Find the probability that one of the tickets drawn is even and the other is odd. [3]

(b) Find the probability that at least one of the tickets drawn is odd. [3]

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

SUMMER 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2015 examination in GCSE MATHEMATICS - LINEAR. 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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Paper 1 - Foundation Tier	1
Paper 1 - Higher Tier	6
Paper 2 - Foundation Tier	12
Paper 2 - Higher Tier	16

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PAPER 1 - HIGHER TIER

2015 Summer Linear Paper 1 Higher Tier		Comments
1(a) 300 × 1.52 or equivalent calculation 456 (US dollars)	M1 A1	
1(b) 600÷1.5 or 600×2÷3 or 585×2÷3 or 585÷1.5 or other suitable estimation calculation Estimate in the range (£)360 to (£)410 or (£)300, from at least 1 appropriately estimated value	M2 A1	Allow 600÷2 (as both values are rounded to1 sig. fig.) Do not accept 585÷2 M1 for 600÷1.52 or 590÷1.52 or 585÷1.52 (original question) or trial as far as '£100 is approximately $150' without further refinement *If no working, SC1 for a suitable estimate within tolerance given*
2(a) 1 cm represents either 25 km or 25 000 m or 2 500 000cm 1 : 2 500 000	M1 A1	Do not accept 4 cm represents 100 km (given in question) An answer of 1 : 25 is M0 (and A0) however allow 1 : 25 km for M1 1 : 2.5 million Allow 1: 2 500 000cm (must be within a ratio)
2(b) 100 / 2hr 30 min or 200 km in 5 hours 100 / 2.5 or 200/5 40 (km/h)	M1 m1 A1	Accept time written incorrectly, for the idea distance /time, e.g. 100/2.3, 100/150 Alternatively M1, m1 for 20km in 30 minutes Sight of 40 irrespective of units given
3. (<ECB =) 76(°) (<EBC =) 180(°) - 76(°) - 76(°) (=) 28(°) (x =) 152(°) Reasons in any order: • Alternate or allied or (co)interior • Isosceles triangle (with angle sum 180°) • Angles on a straight line (180°) OR exterior angle equal to the sum of the two opposite interior angles OR for a 2nd time: Alternate or allied or (co)interior	B1 M1 A1 A1 E2	Accept shown on the diagram or other indication FT 'their 76°' FT their 28(°) provided M1 awarded *Alternatively:* *(<ECB =) 76(°)* *B1* *((x =) <BEC = 76(°) leading to) 76(°) + 76(°)* *M2* *FT 'their 76°'* *152(°)* *A1* All 3 appropriate reasons given E1 for any 2 of the 3 reasons given Do not accept informal descriptions of angles on parallel lines
4. Bearing of 055(°)	B2	B1 for an answer of 55(°), or their final answer is from the calculation 235(°)-180(°) or 90(°)-35(°)

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2015 Summer Linear Paper 1 Higher Tier		Comments
5. For spoons: sight of 450÷180 OR sight of 450 split as 360**,** 90 or 180, 180, 90 (Machine stopped at) 11(:)30 (am) For forks: 240 × 2.5 OR 240÷60 = 4 (forks per minute) **and** (4)× 150 or equivalent 600 (forks) Look for: • Appropriate labelling of calculations, e.g. 'number of spoons', 'time to produce 450 spoons', 'number of spoons produced in 10 minutes', 'number of forks produced', etc • Time written correctly, 11(:)30 (am) QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A2 M1 A1 QWC 2	OR 3(spoons per min) or 30(spoons in) 10 mins A1 for 2.5 (hours) or 2 hours 30 minutes or 150 minutes For A1 allow poor or incorrect notation of time, e.g. 2.3 hrs FT 'their 2.5 hours' or 'their 150 minutes' FT 'their 2.5 hours' provided not a whole number or 'their 150 minutes' provided not a multiple of 60 *Alternative if the time period is not considered (for max 3 marks):* *M1 for an attempt to find the multiplier180 × … = 450, e.g. 18:24* ***and*** *450÷18 (=25),* *M1 for a final calculation that could lead to a correct answer, e.g. applying the multiplier to the right hand side of their ratio, for attempt 24×450÷18* *A1 for 600 forks* 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.
6(a) Correct rotation	B2	B1 for a near miss i.e. not on grid points but within the small grid square, or for 90° clockwise rotation about (2, -1), or for 2 vertices correct
6(b) Correct enlargement, scale factor ½ in correct position	B2	B1 for scale factor ½ enlargement but incorrect position, or for correct position with intention scale factor ½ with at least 2 lines drawn correctly
7. 180 – 162 (= 18) 360 ÷ (180 – 162) 20 (sides)	M1 m1 A1	 CAO *Alternative:* *n × 162 = (n – 2)×180* *M2* *OR M1 for sight of matched trial with value of n>9 with attempt to calculate n × 162 <u>and</u> (n – 2)×180* *n = 20 (sides)* *A1*
8. ⅙ × ⅙ 1/36	M1 A1	Allow for identification of 1 out of 36 outcomes, e.g. 2-way table, or sight of 1 in 36, or 1 out of 36, or 1:36 CAO

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2015 Summer Linear Paper 1 Higher Tier		Comments
9(a) (x =) 3	B2	Accept embedded answers for B2 or B1 B1 for one correct **evaluated** trial (excluding x=0) x: 1, 2, 3, 4 / $x^3 - 2x$: -1, 4, 21, 56 B1 for 27 – 6 = 21 without showing an embedded x = 3 or giving an answer x =3 **and** x = -3
9(b) y = 7, y = -7 OR y = ±7	B2	B1 for either solution, or B1 for (y – 7)(y + 7) = 0, y = ±√49 B0 for (y – 7)(y + 7) or y = √49 Allow B2 for embedded answers, e.g. $-7^2 = 49$ and $7^2 = 49$, or B1 for one embedded answer
9(c) Expression $3x^4 - 5x^3$	B2	Mark final answer B1 for sight of either term correct
10. 19/4 + 19/8 or 4+2 + 6/8 + 3/8 or $4^6/_8 + 2^3/_8$ or $\frac{38}{8} + \frac{19}{8}$	B1	For B1 allow 28.5/4 or 7.125 or $7^{0.5}/_4$
$\frac{38 + 19}{8}$ or $\frac{57}{8}$ or $6\,^9/_8$	B1	Or equivalent, e.g. 114/16 or 228/32, etc. FT from 1 error in the calculation of 1 of the numerators provided the denominators are common
$7^1/_8$	B1	*If no marks, allow SC1 for an answer of 1⅛ from ¾+⅜*
11. Volume = $\pi \times 4^2 \times 10$ or $3 \times 4^2 \times 10$	M1	
480(cm^3)	A1	ISW (change of units). Ignore units given for A1, but they must be correct in order to award E1
Conclusion, e.g. 'incorrect as it is approximately (0).48 litres', 'no he is wrong it holds about 480cm^3 not 5000cm^3', 'no he is incorrect as it is 4520cm^3 difference'	E1	'No' or 'incorrect' may be implied. The reason must be showing comparison (like units), e.g. 0.48(0) (with 5 litres), or 480 with 5000 (cm^3), or 480cm^3 approximately 500cm^3 with 5000cm^3 FT 'their 480 (cm^3)' provided M1 awarded and 'their 480' has dimensionally correct units for comparison with 5 litres
12(a)(i) 4n + 5 or equivalent unsimplified	B2	B1 for sight of 4n
12(a)(ii) States or implies 'YES' with a reason, e.g. ' yes as 149-5 = 144 and this can be divided (exactly) by 4', OR 'correct as 144 is a multiple of 4', OR 'n = 36', OR 'adding 4 repeatedly after the 29 giving 149', OR 'Yes as (149 – 29)÷4 is a whole number'	E1	Do not award for 'correct' or 'yes' without a valid reason Accept 'n=36' as 'implies yes' Accept correct full sequence to 149 or partial sequence shown with at least 3 correct terms including 149, e.g. 145, 149, 153 or 49… 69…. 129 … 149 FT based on 149 – 'their 5' then divided by 4, provided equivalent level of difficulty
12(b)(i) 9×10 or 90 or 10 × 11 States or implies Imran is incorrect, e.g. 'Imran is incorrect as there are 90 panes', 'It is the number of panes in Pattern 9', '90 is Pattern 8', '110 is Pattern 9'	M1 A1	

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2015 Summer Linear Paper 1 Higher Tier		Comments
12(b)(ii) **Shows** that $n^2 + 3n + 2 = (n+1)(n+2)$ Pattern justification: e.g. 'Product of 1 more across than Pattern number and one more vertically than across', OR 'Multiplication of one extra across and two extra up'	E1 E1	Alternative: E2 for working from spatial arrangement $(n+1)(n+2)$ expanding to show $n^2 + 3n + 2$ OR E2 for full spatial description with justification based on shading or labelling parts in diagrams as n^2, 3n and 2 OR alternative: E1 for sight of $an^2 + bn + c$ and second difference 2 leading to a = 1, and E1 for use of n = 1 and number of squares 6, with n = 2 and number of squares 12 to find b=3 and c = 2, or other 2 values of n with the correct number of squares *If no marks, allow SC1 for correct substitution and evaluation of n=1, n=2, n=3 and n=4 in n^2+3n+2 giving answers 6, 12, 20 & 30, substitution must be seen, not for answers only*
13(a) 32, 78, 132, 150, 160	B1	
13(b) Plotting all points at the upper bounds All 7 accurate upper bound plots joined with a curve or lines	B2 B1	FT their cumulative table only if cumulative Must be accurate on vertical lines and horizontal lines B1 if one error in plots, OR for all vertical points (not bars) correct but not at upper bounds
13(c) Idea UQ – LQ, with an attempt at readings in £s and intention to subtract Interquartile range accurate for their cumulative graph	M1 A1	FT from their cumulative graph Accuracy within 1 small square
13(d) Answer from their cumulative graph OR an answer in the range 24 to 25	B1	*Answer approximately 24* Accuracy within 1 small square
14(a) $(x – 3)(x + 5) (= 0)$ $x = 3$ and $x = -5$	B2 B1	B1 for $(x \ldots 3)(x \ldots 5)$ Strict FT from their factorising. FT provided B1 previously awarded *Alternative:* $x = \frac{-2 \pm\sqrt{(2^2 - 4\times1\times-15)}}{2}$ *M1 allow 1 slip in substitution* $= \frac{-2 \pm\sqrt{64}}{2}$ *A1* *$x = 3$ and $x = -5$* *A1* If trial & improvement is used, both solutions are required for B3, otherwise B0
14(b) $12a^9b^6$	B2	B1 for $12a^9..$, or $12..b^6$, or $\ldots a^9b^6$ or $12\times a^9\times b^6$ Mark final answer

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2015 Summer Linear Paper 1 Higher Tier		Comments
15. Sight of $2x+3y + 2x + 3y = 94$ OR $x+6+y+4+x+6+y+4 =56$ $4x + 6y = 94$ AND $2x + 2y = 36$, or unsimplified equivalents of both equations	S1 M1	May be implied in later working Allow S0 but M1 for $2x + 3y = 94$ AND $x + y = 46$, or consistent unsimplified equivalents of these equations
Method to solve, equating x or y, allowing 1 error in non equate variable	M1	FT 'their equations' with equivalent level of difficulty
First variable Method to find 2nd variable, substitution Second variable	A1 m1 A1	**x = 7 (cm)** or **y = 11 (cm)** FT 'their equations' or 1st variable
Method to calculate 1 area, e.g. $(2\times7) \times (3\times11)$ or $(7+6) \times(11+4)$	M1	FT, for the M mark only, 'their x' and 'their y' provided at least M1 previously awarded
462 (cm^2) AND 195 (cm^2)	A1	CAO *(Incorrectly using ½ perimeter leads to:* *$2x + 3y = 94$ AND $x + y = 46$ giving x=44(cm) & y=2(cm)* *and areas $528cm^2$ and $300cm^2$ which is awarded S0, M1, M1, A1, m1, A1, M1, A0 giving 6 marks)*
16(a) Method of finding an area 2 correct areas AND intention to add all areas 250	M1 M1 A1	 Areas are 10+60+100+40+20+20 CAO
16(b) $(100 \times) 30/250$ 12(%)	M1 A1	FT their (½ ×20 + 20)/ 'their 250', including from non area consideration in (a) 3/25 *If no marks, award SC1 for an answer of 88(%)*
16(c) Identifying the 125, 125 split or 125.5 55 or 55.5 (or 44.5 or 45) as a proportion of the 100 or equivalent 25.5 (minutes) or 25.6 (minutes)	M1 m1 A1	Accept sight of (250÷2 =) 125 FT must be from <u>at least M2 awarded in (a)</u> <u>No FT</u> from an answer of 25 in (a) May be indicated on the histogram. Sight of $20 + 10 \times 55/100$, or $30 – 10 \times 45/100$ is awarded M1, m1 Accept a vertical line at 25.5 indicated on the histogram CAO. Must be stated. Do not accept 25.55 (minutes)
17(a) Attempt to subtract $10x = 3.4646..$ from $1000x = 346.46…$ or alternative method 343/990	M1 A1	Or equivalent for $100x = 34.646..$ and $x =0.34646..$ Final answer of 34.3/99 M1 only
17(b) $49 - 35\sqrt{2} -35\sqrt{2} + 50$ $= 99 -70\sqrt{2}$ Irrational	B1 B1 E1	 FT correctly simplified (equivalent level of difficulty) provided at least 3 of the terms are correct OR $49 \pm a\sqrt{2} + 50$ with $a\neq0$ Depends on 'their answer' including a surd and at least B1 previously awarded
18(a) Tangent drawn at t=1.5 Method, difference y / difference x Evaluated answer correct to 1dp from their reasonable tangent	B1 M1 A1	
18(b)(i) For the 4 appropriate values of v Split into the 3 areas and attempt to sum, or an attempt to substitute into the trapezium rule Correct substitution into trapezium rule, $^3/_2(0+0+2(8 +5))$ 39 (m)	B1 M1 A1 A1	May be seen on the graph or in working t: 0, 3, 6, 9 v: 0, 8, 5, 0 *Attempt at substitution would be …(0+0+2(8+5)) or $^3/_2(0+0+2(8 +5))$ with either 8 or 5 incorrect* OR for 3 correct areas 12, 19.5, 7.5 with an attempt to sum CAO
18(b)(ii) Example, 'use more ordinates', 'cut into narrower strips', or consideration of the additional area	E1	Do not accept 'count squares'

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2015 Summer Linear Paper 1 Higher Tier		Comments
19(a) 10/20 × 10/19 (= 100/380) 10/20 ×10/19 + 10/20 × 10/19 200/380 (=10/19)	B1 M1 A1	 OR 2× 10/20 × 10/19 Ignore incorrect cancelling *Alternative* *1 × 10/19 M2* *10/19 A1*
19(b) 1 – P(even, even) = 1 – 10/20 × 9/19 (1 – 9/38) = 29/38 (= 290/380)	 S1 M1 A1	*FT from (a) if P(OE) and P(EO) and P(OO) used* OR P(OE) + P(EO) + P(OO) OR FT (a) + P(OO) May include replacement 10/20×10/19+10/20×10/19+10/20×9/19 OR (a) + 10/20×9/19 CAO. Ignore incorrect cancelling

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Surname	Centre Number	Candidate Number
Other Names		0

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GCSE

4370/05

A14-4370-05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. WEDNESDAY, 5 November 2014

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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.

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***(c)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**11**	
3.	**6**	
4.	**9**	
5.	**7**	
6.	**4**	
7.	**7**	
8.	**8**	
9.	**11**	
10.	**10**	
11.	**3**	
12.	**7**	
13.	**5**	
14.	**5**	
15.	**3**	
Total	**100**	

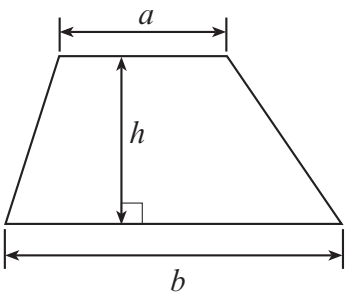
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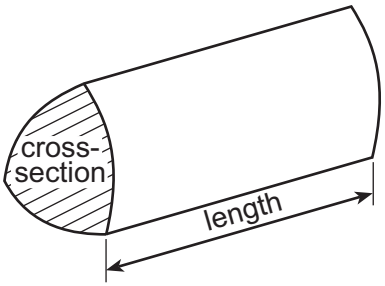
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Formula List

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

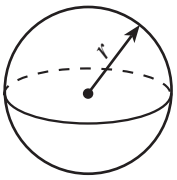


Volume of prism = area of cross-section × length



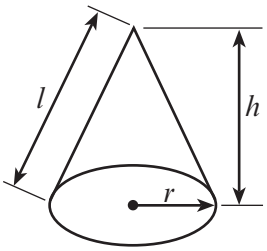
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

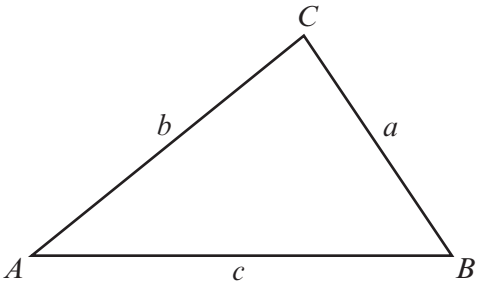


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

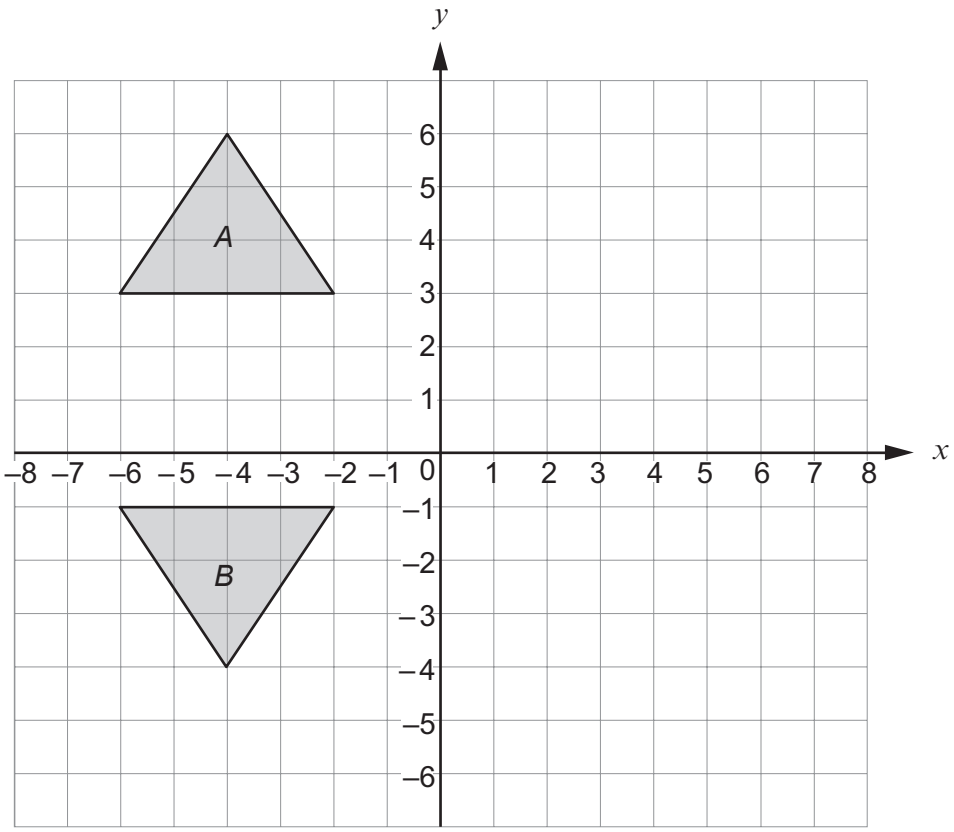
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1.



The diagram shows the transformation of triangle *A* to triangle *B*.

(a) Fully describe a possible transformation of triangle *A* to triangle *B*. [2]

.....

.....

.....

.....

(b) Rotate triangle *A* through 90° clockwise about the origin.
Label your answer *C*. [2]

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Turn over.

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2. *(a)* Solve $\frac{3x}{4} = 36$. [2]

(b) Solve $\frac{9}{x} = 18$. [1]

(c) Solve $5x - 12 = 3(x + 6)$. [3]

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(d) Solve the inequality $9x + 5 < 77$. [2]

(e) Write down the smallest whole number that satisfies the inequality $4x > 45$. [2]

Smallest whole number is .....

(f) Simplify $10x \times 5x \times 2x$. [1]

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3. *(a)* The product of three consecutive prime numbers is 385.
Find the **sum** of these three prime numbers. [3]

Sum of these three prime numbers = ...

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(b) Express the highest common factor of 24 and 40 as a product of prime numbers in index form. [3]

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4. Sophie is going on holiday.

(a) Sophie travels a distance of 35 miles in 2 hours 30 minutes through busy traffic.

Calculate Sophie's average speed, in miles per hour. [3]

(b) Sophie's luggage weighs 22lb.



Approximately how much does her luggage weigh in kg? [1]

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

Sophie is due to fly from Glasgow to San Francisco.
She arrives at Glasgow airport on Wednesday at 13:40.
She has to wait 4 hours 25 minutes for her flight.

It takes 13 hours to fly between Glasgow and San Francisco.
She knows that the time in Glasgow is 8 hours ahead of the time in San Francisco.
For example, when it is 10:00 a.m. in Glasgow it is 2:00 a.m. in San Francisco.

On which day and at what time does Sophie expect to arrive in San Francisco airport?
You must show all your working. [5]

Day ..... Time .....

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5. *(a)* Abhu has an old bike that has been damaged.
The wheels are missing but he still has the frame.

He has made a sketch of the damaged frame as shown below.

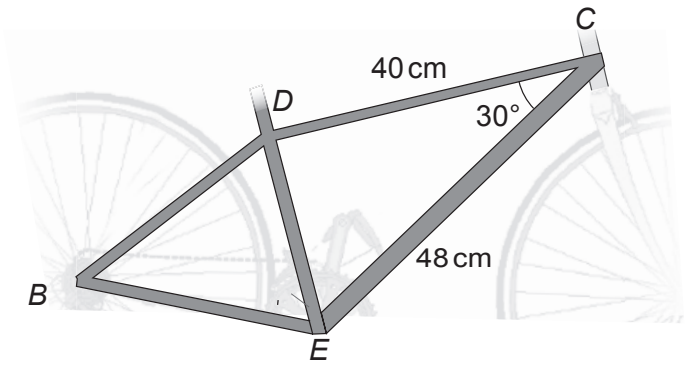
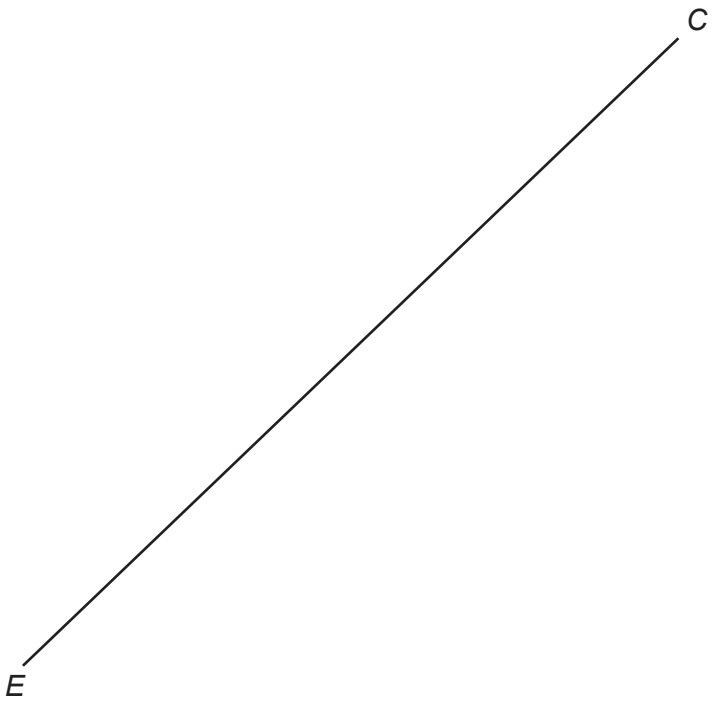


Diagram not drawn to scale

Abhu needs to know the actual length *DE* so that he can buy a new part.

Using a pair of compasses and a ruler only, construct a scale drawing of triangle *DCE.*
Use a scale of 1 cm to represent 4 cm.
You must show all your construction lines.

Hence find the actual length of *DE*. [5]



.....

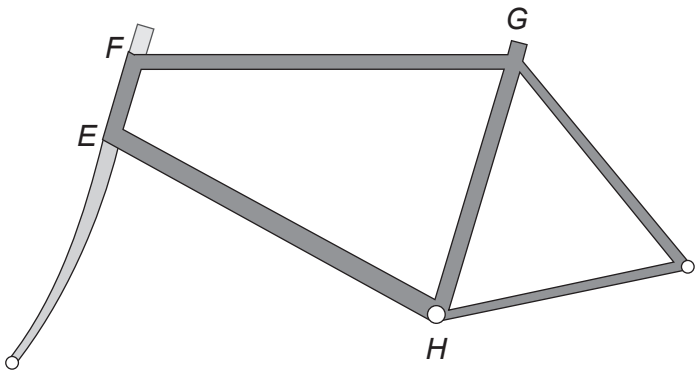
Actual length of *DE* = ...

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(b) Abhu's friend Val has a bike frame for sale.
The diagram below is a scale drawing of Val's bike frame.



Abhu believes that *FE* is parallel to *GH*.
Use your protractor to show that Abhu is correct.
You must give reasons for your answer. [2]

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6. The diagram shows a rectangle *ABCD*.

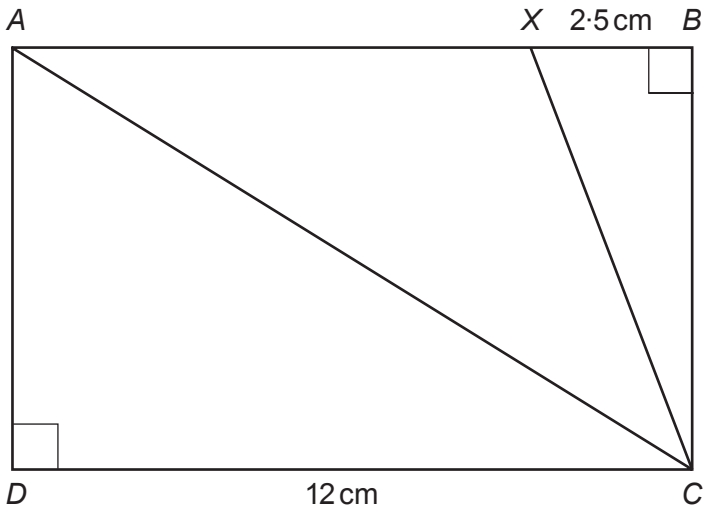


Diagram not drawn to scale

Given that $XB = 2{\cdot}5\,\text{cm}$, $DC = 12\,\text{cm}$ and the area of triangle *ADC* is $60\,\text{cm}^2$, calculate the area of triangle *XBC*. [4]

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7. *(a)* Solve the following equation. [4]

$$\frac{20 + 3x}{4} + \frac{5 - x}{5} = \frac{13}{4}$$

(b) Factorise $x^2 - 10x + 16$ and hence solve the equation $x^2 - 10x + 16 = 0$. [3]

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8. The table shows some of the values of $y = 3x^2 + 2$ for values of x from -2 to 2.

(a) Complete the table by finding the values of y when $x = -2$ and $x = 2$. [1]

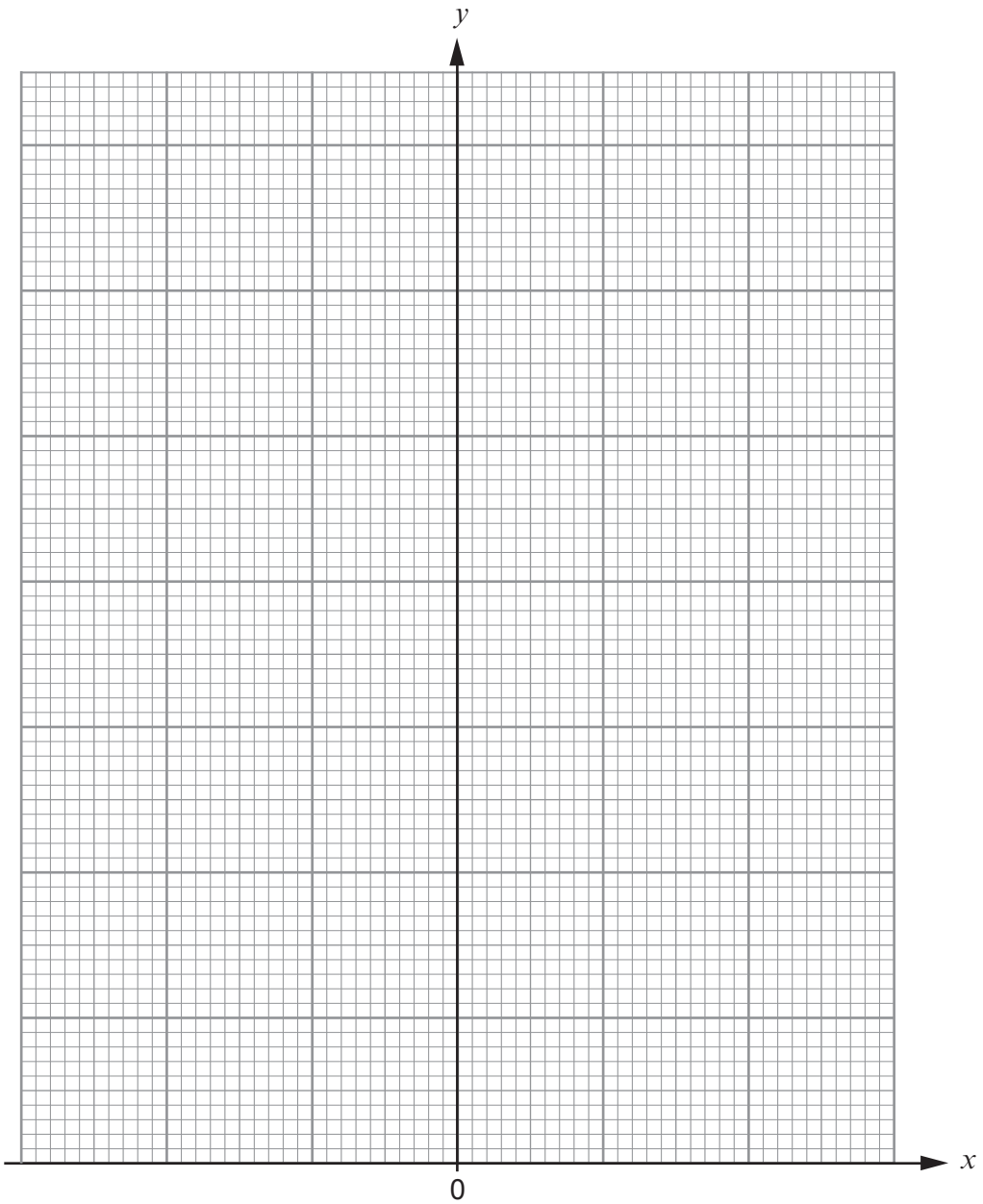
x	–2	–1	0	1	2
y		5	2	5	

.....

.....

.....

(b) Using the graph paper below, draw the graph of $y = 3x^2 + 2$ for values of x between -2 and 2. [3]



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(c) Write down the coordinates of the point on $y = 3x^2 + 2$ where the gradient of the curve is zero. [1]

(..... , ...)

(d) When the line $y = 2x + 5$ is drawn between $x = -2$ and $x = 2$, it intersects the curve $y = 3x^2 + 2$ at two points.
Use your graph to find the coordinates of the points of intersection. [3]

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Points of intersection at (..... , ...) and (..... , ...)

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9. *(a)* A fair dice is thrown twice.



The score is noted each time the dice is thrown.
Calculate the probability of getting at least one six. [3]

(b) Carwyn has bought a 10-sided dice.



Carwyn was not sure if the dice was a fair dice.
He carried out an experiment.
He recorded the number of sixes he threw in every 10 throws of the dice.

Number of throws	10	10	10	10	10	10	10	10	10	10
Number of sixes	4	3	2	3	2	4	2	4	3	2

He decided to create a table to show the cumulative number of sixes thrown, to calculate the relative frequencies.

Number of throws	10	20	30	40	50	60	70	80	90	100
Number of sixes thrown	4	7	9	12	14	18	20			
Relative frequency of throwing a six	$\frac{4}{10}$	$\frac{7}{20}$	$\frac{9}{30}$	$\frac{12}{40}$	$\frac{14}{50}$	$\frac{18}{60}$	$\frac{20}{70}$			
	0·4	0·35	0·3	0·3	0·28	0·3	0·29			

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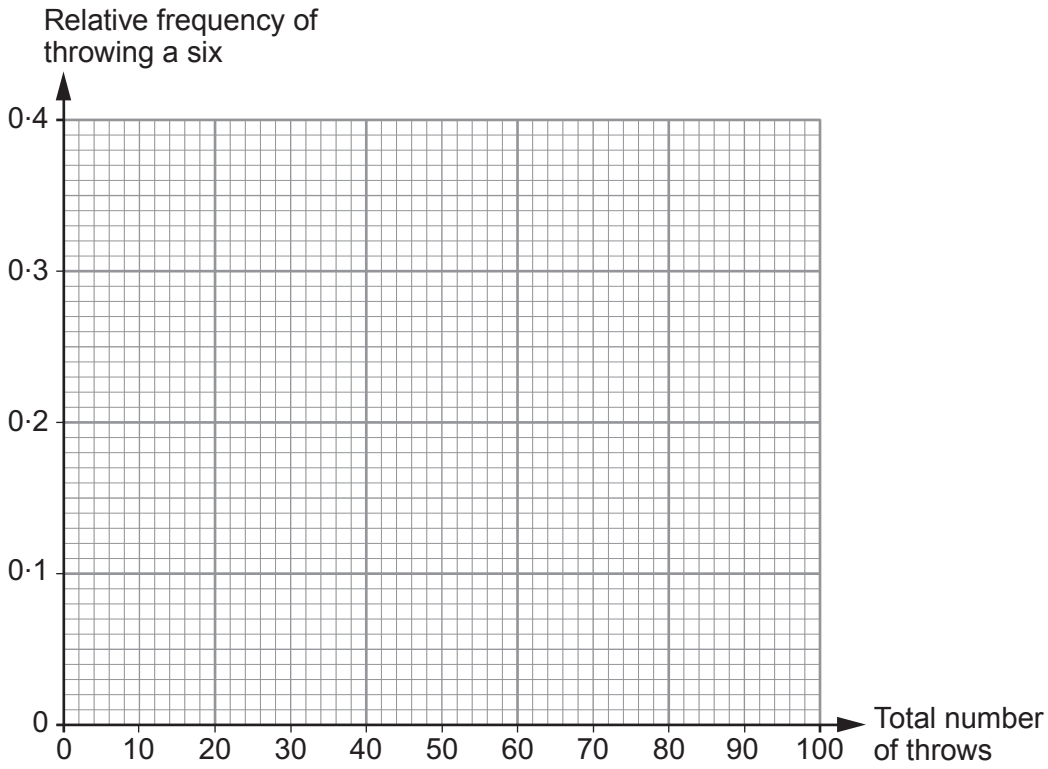
(i) Complete Carwyn's table opposite. [3]

.....

.....

.....

(ii) Draw a graph to illustrate the relative frequency of throwing a six on Carwyn's 10-sided dice. [2]



(iii) Using the above results, write down the best estimate for the probability of **not** obtaining a six on Carwyn's dice, giving a reason for your answer. [2]

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(iv) Carwyn says that the dice is not a fair dice.
Explain why Carwyn's statement could be true. [1]

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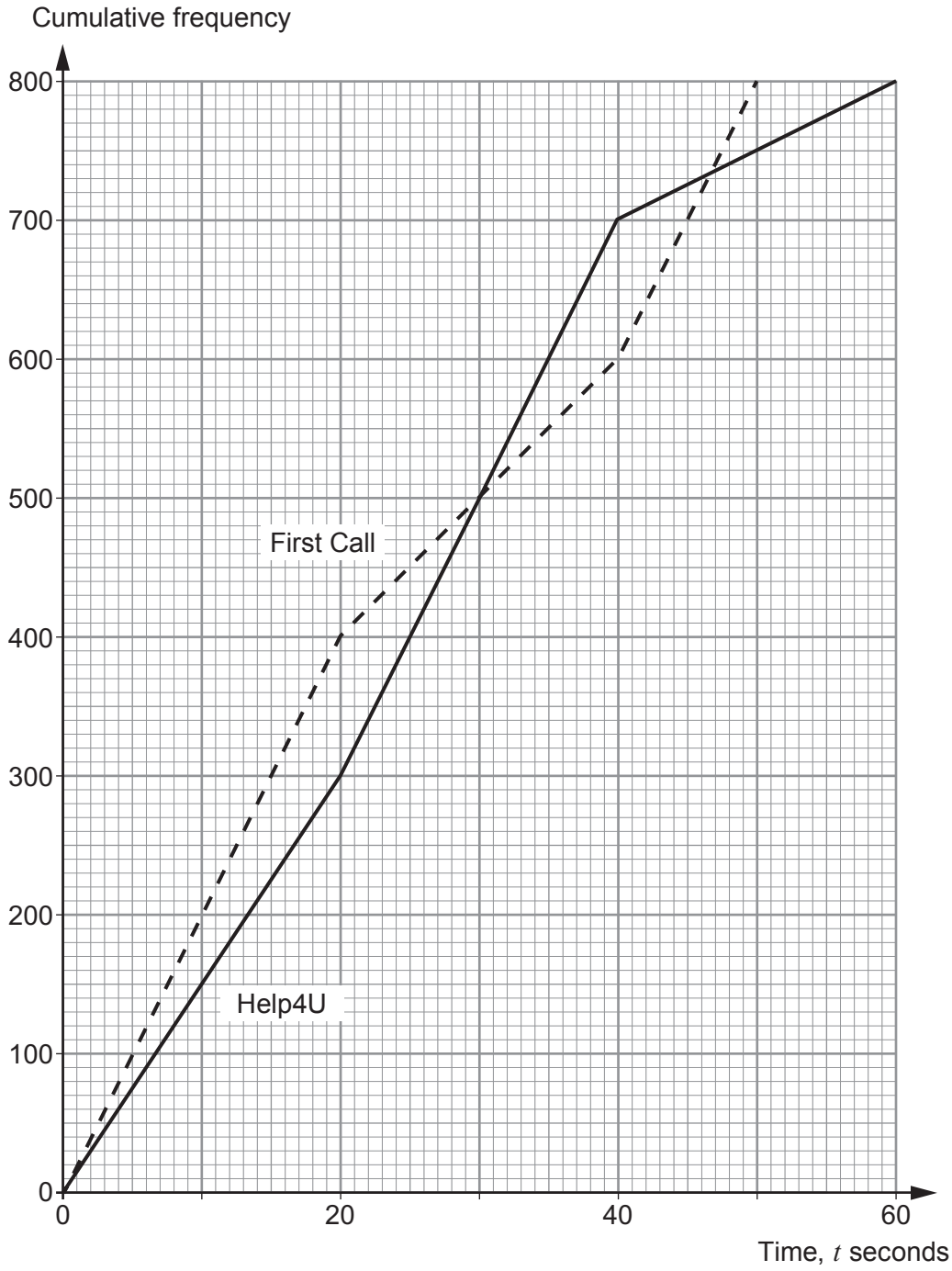
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10. Help4U and First Call are two different telephone help lines.
Information was recorded for the first 800 callers of the day for each helpline.

The cumulative frequency diagram illustrates the time it took for these callers to get through to each of these helplines.



The solid line represents the data for the telephone helpline Help4U.
The dotted line represents the data for the telephone helpline First Call.

(a) How many of the 800 callers to First Call took less than 15 seconds to get through? [1]

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(b) Help4U were set a target to answer 40% of all calls in less than 25 seconds.
They actually met the target with these 800 calls.
By how many seconds did they beat their target? [3]

(c) Which of the two companies had the lower median time and by how many seconds? [2]

(d) Calculate the interquartile range of the times for each company. [3]

First Call

Help4U

(e) One of these companies was given an award for the speed of answering the telephone.
Which company do you think won the award?
You **must** give a reason for your answer. [1]

Examiner only

11. The diagram shows a circle with centre O.
The three points A, B and C lie on the circumference of the circle.
The tangent XAY touches the circle at A.

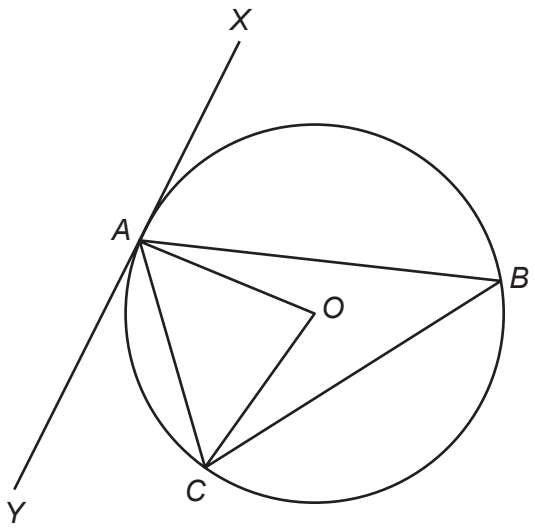


Diagram not drawn to scale

Given that $A\hat{O}C = 6x°$, find an expression for $Y\hat{A}C$ in terms of x.
You must give a reason for each stage of your working.
Express your answer in its simplest form. [3]

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12. Write each of the following in its simplest form.

(a) $\sqrt{50}$ [1]

(b) $\sqrt{40} \times \sqrt{20}$ [3]

(c) $\left(3 + 2\sqrt{5}\right)\left(2 - \sqrt{5}\right)$ [3]

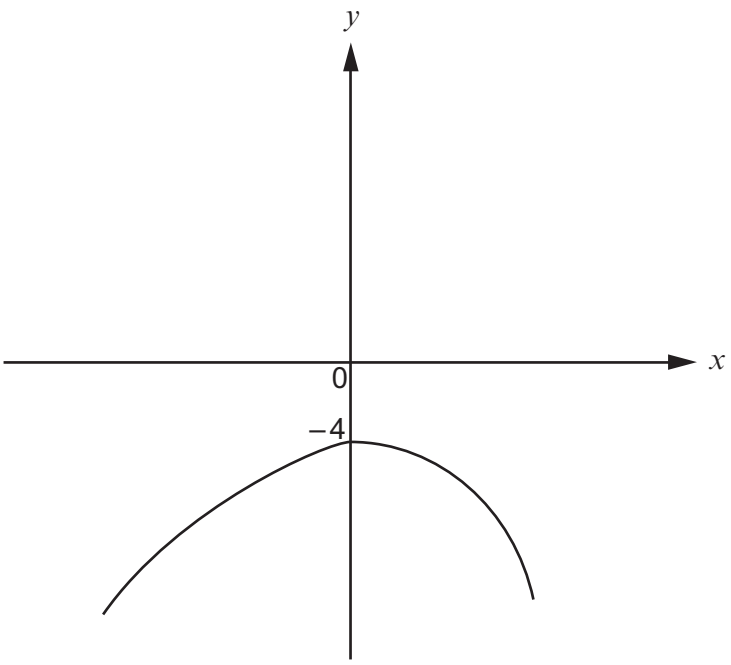
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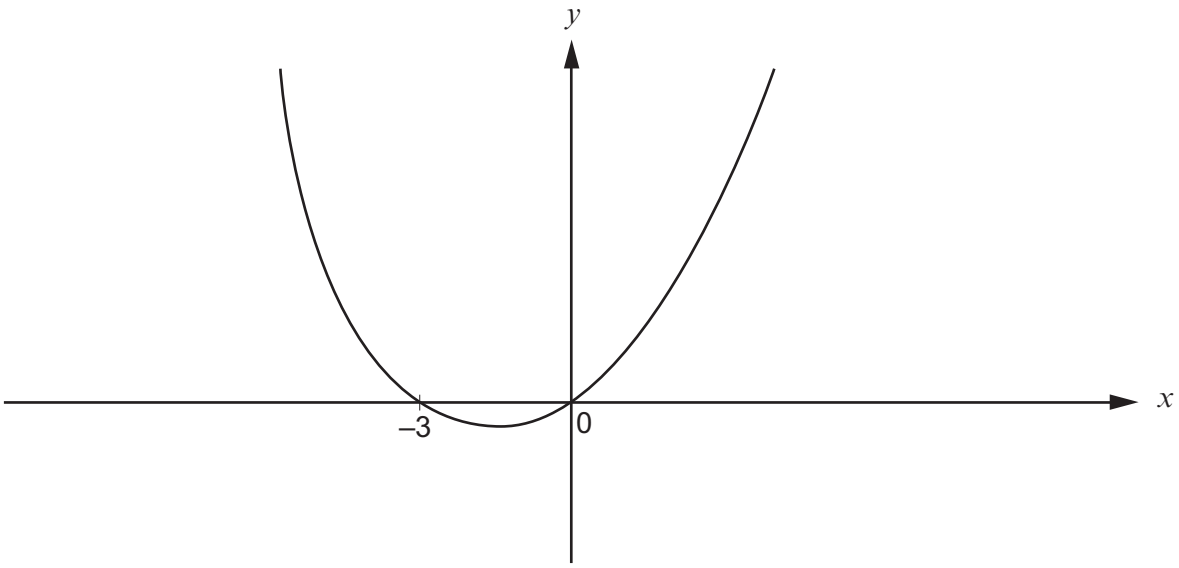
Turn over.

Examiner only

13. *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x)$.
Mark clearly the coordinates of any point where this curve crosses an axis. [2]



(b) The diagram shows a sketch of $y = g(x + 2)$.
On the same diagram, sketch the curve $y = g(x - 4)$.
Mark clearly the coordinates of the points where this curve crosses the x-axis. [3]



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14. Express the following as a single fraction in its simplest form. [5]

$$\frac{4x+3}{2x-1} - \frac{6x-5}{3x+1}$$

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15.

A	sin46°	E	sin44°
B	sin146°	F	sin316°
C	sin134°	G	sin224°
D	sin314°	H	sin136°

Sallie and Bethan are playing a game by matching cards of equal value.

Sallie matches card A with card D.
Bethan matches card E with card H.

Who is correct?
You must sketch a graph to explain your answer. [3]

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Space for sketch:

END OF PAPER

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

NOVEMBER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2014 examination in GCSE MATHEMATICS - LINEAR. 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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PAPER 1 - HIGHER TIER

GCSE Mathematics - Linear Paper 1 Higher Tier November 2014	Marks	Final Mark Scheme Comments
1.(a) Reflection (in) y = 1 OR rotation 180° about (-4, 1) OR rotation 180° about origin or (0, 0) followed by translation $\begin{vmatrix}-8\\2\end{vmatrix}$ or enlargement -1 with centre (-4, 1) or equivalent	E2	Do not accept informal or imprecise language such as 'flipped' or 'mirror' or 'translation' for E2 E1 for 'rotation' or ('turn around') 180° with (-4, 1) indicated, OR 'reflection' and an attempt to indicate a horizontal line (accept incorrect lines) or reflection in x=1, OR for 'flipped in y=1' or 'mirror in y=1' but do not allow 'flipped' or 'mirror' with y=1 drawn but not described, OR E1 for rotation 'about (0, 0)' or '180°' <u>and</u> translate $\begin{vmatrix}-8\\2\end{vmatrix}$
(b) Correct rotation	B2	B1 for anticlockwise 90° about the origin OR 90° clockwise about origin of triangle B
	4	
2.		Accept embedded answers in parts (a), (b) & (c)
(a) x = 36×4/3 or 3x = 144 or x/4 = 12 or x = 12×4	B1	Do not accept 3x = 36×4, or x/4 = 36/3
x = 48	B1	FT from 1 error in calculation to allow maximum B0, B1 An answer of x = 144/3 is B1, B0 as this must be evaluated
(b) x = ½ or 0.5 or 9/18 or equivalent	B1	Mark final answer
(c) (5x – 12 =) 3x + 18	B1	FT until 2nd error
5x – 3x = 18 + 12 or 2x = 30	B1	
x = 15	B1	If FT leads to a whole number, answer must be given as whole number, otherwise allow as an improper fraction
(d) 9x< 77 – 5 or 9x < 72 or x < 72/9	M1	
x<8	A1	A0 for a final answer 'x=7', however ignore continuation to state x = 7, 6, 5, … with x<8 seen award A1 No marks for use of "=" throughout, unless finally replaced to give x<8 then award M1 A1. *SC1 for x<82/9 ISW*
(e) x > 45/4 or x>11.25 or x> 11¼	M1	Or sight of 4×11 = 44 with 4×12 =48
12	A1	Accept unsupported 12, or a unique answer of 12 from a trial and improvement method. Do not accept x>12 or x <u>≥</u> 12
(f) $100x^3$	B1	
	11	
3.(a) Prime numbers are 5, 7 and 11	B2	B1 for sight of any 1 correct division by a prime number leaving no remainder before 2nd error, OR for a correct evaluation of the product of a trial of any 3 prime numbers
Sum 23	B1	FT sum of 3 **PRIMES** provided previous B1 awarded **<u>and</u>** provided their product of 3 primes is >100
(b) HCF 8 or 2 × 2 × 2 or 2^3	B2	B1 for sight of factors of 24 : 2, 2, 2, 3, OR for sight of factors of 40 : 2, 2, 2, 5, OR for sight of factors 8, 3 and 8, 5 (may be in working) without implication of 8 as HCF *B0 for factors 4, 6 and 4, 10*
HCF 2^3	B1	FT for their HCF provided index notation required and used correctly. *Do not accept as embedded in product of factors of 24 and 40, needs to be as identified HCF*
	6	

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GCSE Mathematics - Linear Paper 1 Higher Tier November 2014	Marks	Final Mark Scheme Comments
4.(a) Use of distance /time (35/2.5)	B1	For example, accept 35/2.3(0) or 35/150 *An answer of 15.2…. implies this first B1*
35/2.5	B1	
14(mph)	B1	CAO *Alternative: 70÷5 B2 then 14(mph) B1, or* *35/5 = 7 with 7+7 B2, then 14(mph) B1* *(35/7 is insufficient to convince distance/time)*
(b) 10(kg) or 11(kg)	B1	
(c) (In Glasgow time flight arrives San Francisco at) 13:40 add 4h 25 min add 13 h (7:05 on Thursday/next day)	M1	All times and periods and attempt addition forward May be in stages. Accept 4.25 as indication of 4hr 25mins
(To find San Francisco time) subtract 8 h	M1	Intention 8 hours back from their intention of addition of 4h 25min or 13 h to 13:40
23(:)05 on Wednesday (same day)	A1	CAO An answer of 23:05 without stating Wednesday is M1, M1, A0. Allow 23(:)05 pm, but do not allow 23(:)05 am Accept 11(:)05 pm. Allow 11(:)05 Wednesday night
Look for: • spelling • clarity of text explanations, where and in which time zone Glasgow or San Francisco • the use of notation and units	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.
QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer		QWC1 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.
QWC1: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
	9	
5.(a) CD length is 10cm (±2mm) and attached to DE at D	B1	
Arcs to show construction of 60° and bisection arcs to show 30° constructed, tolerance ±2°	B2	B1 for the appropriate arcs and construction of 60°(±2°)
Accurate measure of their DE (±2mm)with intention ×4	M1	*Approximately 6cm*
..… cm	A1	Units must be given. FT their DE×4 evaluated correctly *Approximately 24cm*
(b) Measures either <GFE (107°) **and** <FGH (73°) or <FEH (102°) **and** <GHE (78°) or an appropriate pair of alternate angles, to accuracy ±2°	B1	Measures alternate or corresponding angles for a straight line intersecting with a pair of parallel lines
Conclusion that it is safe with reason based on parallel lines alternate, (corresponding) or allied angle facts	E1	STRICT FT for the conclusion **appropriate** for their angles, i.e. sum 180° conclusion would be parallel, otherwise not Do not accept informal terminology e.g. 'z angles'. A statement of 180° is insufficient.
	7	

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GCSE Mathematics - Linear Paper 1 Higher Tier November 2014	Marks	Final Mark Scheme Comments
6. Area triangle ADC ½ ×12×AD = 60 or equivalent AD = 10 (cm) Area triangle XBC = ½ × 2.5× AD 12.5 (cm^2)	M1 A1 M1 A1 4	FT 'their AD' and/or FT consistent use of 'their area formula' *Alternative:* *(Using ratio of base) Area XBC = 60 ×2.5/12 M1, A1, M1* *= 12.5(cm^2) A1* *OR in parts: 60/12 M1 (**NOT** labelled AD)* *= 5 A1* *Area 2.5 × 5 M1* *= 12.5(cm^2) A1*
7.(a) Intention to multiply throughout by a multiple of 20 OR correct common denominator for LHS 5(20 + 3x) + 4(5 – x) = 5×13 or equivalent 11x = -55 or x = -55/11 x = -5 (b) (x – 8)(x – 2) x = 8 **and** x = 2	M1 M1 A1 A1 B2 B1 7	Intention evidence of at least 2 of the 3 terms LHS must have denominator of 1 FT provided M1 awarded B1 for (x … 8)(x … 2) FT for their pair of brackets
8.(a) 14 and 14 (b) Suitably labelled uniform scales **on** both axes At least 3 points plotted accurately All 5 points plotted accurately and joined with a **curve** (c) (0, 2) or follow through from their graph (d) y = 2x + 5 drawn accurately & intersecting the curve Coordinates of both points of intersection 8	B1 B1 M1 A1 B1 B2 B1	FT from (a) Plots reasonable for the scale and the intention for the curve to pass through all of the points plotted FT from (b), including intersecting 'their curve' B1 for a straight line intersecting the curve **twice** with either the gradient or the intercept correct with gradient >0 FT reasonable for their graphs provided 2 points of intersection, provided at least B1 previously awarded in (d)
9.(a) Idea, P(at least 1 six) = 1 – P(no sixes) = 1 – 5/6 × 5/6 = 11/36 (b)(i) 80 | 90 | 100 **24** | **27** | **29** **24/80** | **27/90** | **29/100** **0.3** | **0.3** | **0.29** (ii) All 10 points plotted accurately (iii) (1 -0.29 =) 0.71 or equivalent Reason, e.g. "last value", "most throws" (iv) Explanation, e.g. 'probability of a fair dice would be 0.1 for each number' 11	M1 M1 A1 B1 B1 B1 B2 B1 E1 E1	OR alternative full method, e.g. 2-way table with 36 outcomes, or 36 outcomes of 2 throws listed, or tree diagram with correct probabilities on the branches Must be calculations that could lead to a correct answer P(2 sixes) + P(1 six & 1 not-six) OR 2-way table with the possible 11 outcomes indicated, or list with 11 possible outcomes, or 1/6×1/6 + 1/6×5/6× 2, or equivalent CAO CAO FT from 1 error, this error may impact on further cumulative values, this counts only as 1 error, check appropriate FT FT their cumulative fractions as decimals, accuracy to 2 d.p. if appropriate FT for their cumulative decimals Ignore joining, tolerance should shown intention to be on grid lines B1 for 7, 8 or 9 points plotted accurately, must be from cumulative results, e.g. first 7 from the table correct, ignore extra workings such as bars FT their final column entry in (i), fraction or decimal Do not accept 'most accurate'. Mark independently of B1 If no estimate given, but statement that 100 throws as more results then award B0, E1 *If no marks, SC1 for 0.7 with a clear statement 'tending to' or 'settling', a reason of 'mode' is not acceptable*

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GCSE Mathematics - Linear Paper 1 Higher Tier November 2014	Marks	Final Mark Scheme Comments
10. (a) 300 (callers) (b) (40% of 800 =) 320 (callers) (reading to give) 21 (seconds) (Difference) 4 (seconds) (c) First Call and 5 (seconds) (d) First Call 40 – 10 OR Help 4U 35 – 13.5 (±0.5) First Call 30 (seconds) Help 4U 21.5 (±0.5seconds) (e) Choice, First Call, with a reason based on correct interpretation of the data, e.g.'The median is lower for First Call', 'All the calls to First Call were answered within 50 seconds, whereas there were 50 calls to Help4U that took over 50 seconds to be answered', 'First Call had answered more calls than Help4U after 10, 20 and 50 seconds, the same number of calls answered after 30 (and 60) seconds, but fewer calls answered after 40 seconds', 'First Call were faster overall'	B1 M1 M1 A1 B2 M1 A1 A1 E1 10	 FT for their 40% of 800. CAO *M1 & SC1 for using First Call with an answer of 9 seconds* Accept unsupported correct response B1 for sight of medians Help 4U 25seconds or First Call 20 seconds or unsupported 5 seconds alone Do not accept from incorrect working, e.g. 30 – 25 = 5 is B0 *If answers are reversed in (d) due to misread of labels, then MR-1 and FT accordingly* For the intention to calculate UQ- LQ Do not accept a reason based solely on the interquartile range. Do not accept 'First Call were quicker' FT for their appropriate choice with interpretation of their previous median answer.
11. (Sight of <ABC =) 3x OR Sight of <OAC or <OCA as ½ (180 – 6x) or equivalent Sight <CAY = 3x Reasons, e.g. ' angle at centre is twice the angle at the circumference AND alternate segment theorem', or 'angles in triangle 180° AND radius meets tangent at 90°'	 B1 B1 E1 3	<u>Any angles may be indicated on the diagram</u> Allow 6x/2 Accept intention (without brackets) Do not accept ambiguous 3x. Must be simplified to 3x. An unlabelled answer of 3x is awarded first B1 only as b.o.d. FT <CAY = 'their <ABC' provided ≠6x
12.(a) $5\sqrt{2}$ (b) Sight of 40 and 20 broken down into factors, e.g. (√) 4×10 and (√) 4 ×5, or (√) 2×2×2×5 and (√) 2×2×5 $20\sqrt{2}$ (c) $6 + 4\sqrt{5} - 3\sqrt{5} - 10$ in this simplified form $-4 + \sqrt{5}$ OR $\sqrt{5} - 4$	B1 B1 B2 B2 B1 7	 OR $\sqrt{40}$ written as $\sqrt{2}\times\sqrt{20}$ Allow $\sqrt{800}$ for B1 B1 for correct but not fully simplified e.g. $4\sqrt{50}$ B1 for any 3 of the 4 terms correct CAO
13.(a)Reflection in the x-axis (0, 4) (b) Horizontal translation Correct translation with (3, 0) and (6,0) indicated on the x-axis	M1 A1 B1 B2 5	 Accept 4 indicated correctly on the y-axis Any horizontal translation without including any other transformation Accept indication of 3 and 6 on the x-axis with the correct translation B1 for a horizontal translation with 1 ((1, 0))and 4 ((4, 0)) indicated on the x-axis as intersections or translation to show y = g(x) with (-1, 0) and (2, 0) indicated or correct translation but only one of the values 3 and 6 indicated.
14. $(4x + 3)(3x + 1) - (2x - 1)(6x - 5)$ as a numerator Sight of $12x^2 + 9x + 4x + 3$ AND $12x^2 - 6x - 10x + 5$ or $-12x^2 + 6x + 10x - 5$ $29x - 2$ <u>$29x - 2$</u> $(2x - 1)(3x + 1)$	B1 M2 A1 A1 5	 M1 for either pair of brackets expanded correctly FT provided M1 awarded CAO. Do not ignore further working

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GCSE Mathematics - Linear Paper 1 Higher Tier November 2014	Marks	Final Mark Scheme Comments
15. Sketch of sine curve, from the origin clearly showing the symmetry 0° to 180° or to 360°	M2	Ignore missing y-values. M1 for sketch of sine curve with no indication of any values or symmetry. If y-values are given incorrectly but sketch otherwise correct, then award M1
Bethan is correct AND 44° & 136° correctly indicated on the sketch	A1	Allow from M1, obviously M0 leads to A0. Allow any unambiguous indication of 44° & 136°, for example unlabelled if given uniquely
	3	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. MONDAY, 9 June 2014

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

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***(b)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**6**	
3.	**4**	
4.	**4**	
5.	**4**	
6.	**10**	
7.	**3**	
8.	**3**	
9.	**8**	
10.	**5**	
11.	**5**	
12.	**6**	
13.	**5**	
14.	**5**	
15.	**3**	
16.	**7**	
17.	**5**	
18.	**6**	
19.	**4**	
Total	**100**	

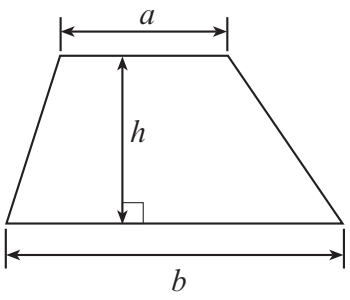
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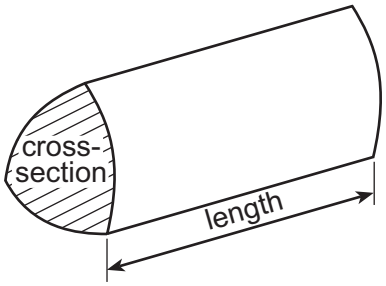
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Formula List

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

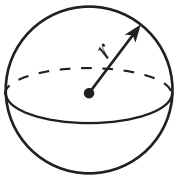


Volume of prism = area of cross-section × length



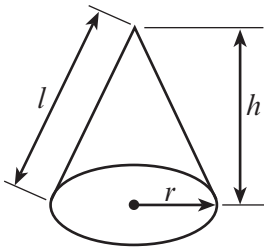
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

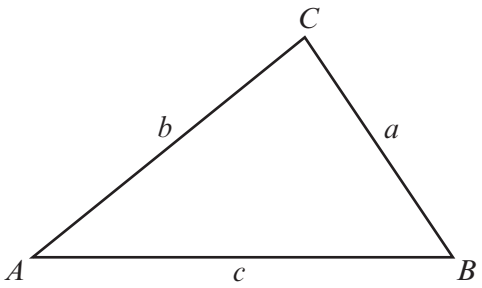


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1. *(a)* Estimate the value of $\frac{43{\cdot}3 \times 49{\cdot}8}{200}$. [2]

(b) Estimate the value of $\frac{0{\cdot}963}{0{\cdot}482}$. [1]

(c) Given that 54 × 732 = 39 528, find the exact value of the following.

(i) 0·054 × 73·2 [1]

(ii) $\frac{39\,528}{0{\cdot}54}$ [1]

(d) Write down the value of one half of $3\frac{1}{2}$. [2]

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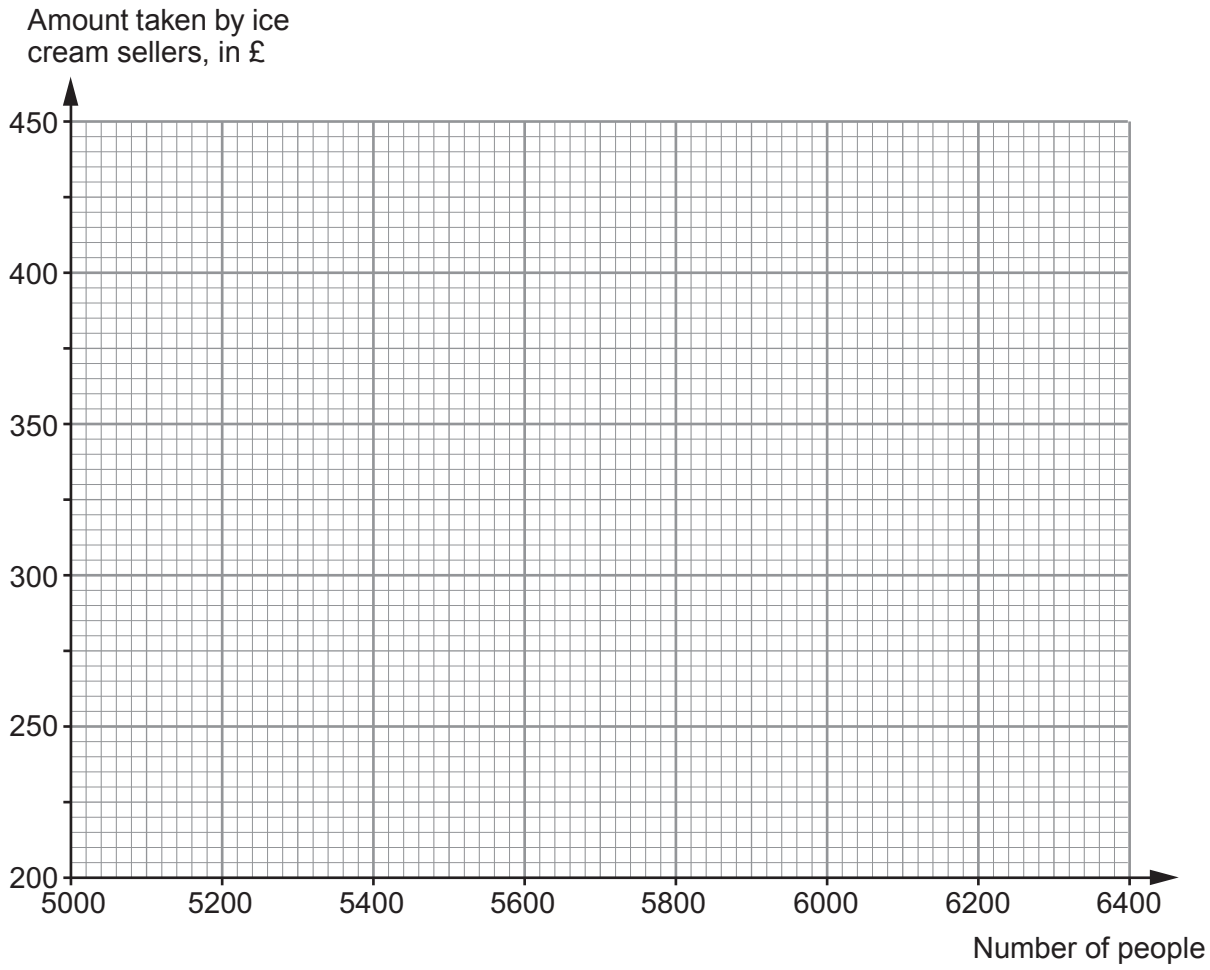
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2. A festival took place over 7 days in August.
Each day, the number of people at the festival and the amount of money taken by the ice cream sellers were recorded.
The table below shows the results.

Number of people	5500	6000	5600	5200	5800	6400	6200
Amount taken by ice cream sellers, in £	280	400	280	210	320	420	410

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



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(b) Write down the type of correlation that is shown by the scatter diagram. [1]

.....

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

(d) Estimate the amount of money that may have been taken by ice cream sellers during one day had 6100 people attended the festival on that day. [1]

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(e) Explain why it is not possible to work out how much a typical ice cream costs at the festival. [1]

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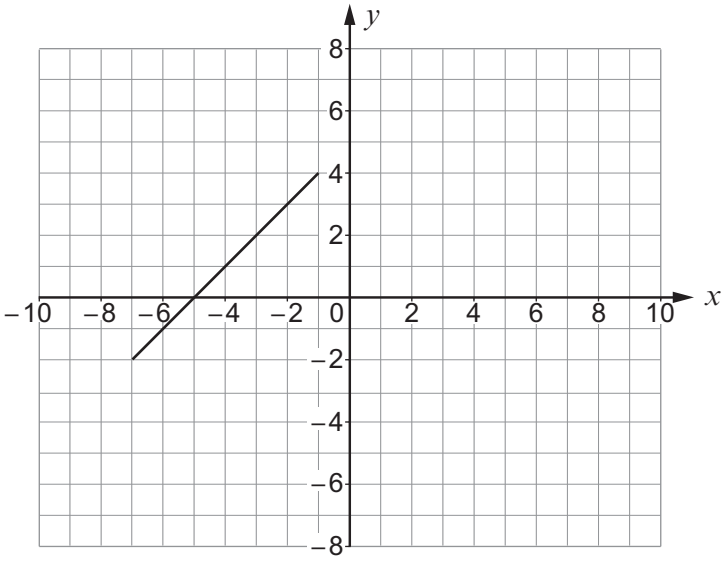
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3. Lorna has begun to draw two quadrilaterals, one on each of two grids.
She had drawn a **diagonal** of a quadrilateral on each grid.

She then gives clues to help you draw the quadrilaterals.

By completing the drawings, write down the coordinates of the vertices of each of the quadrilaterals.

(a)

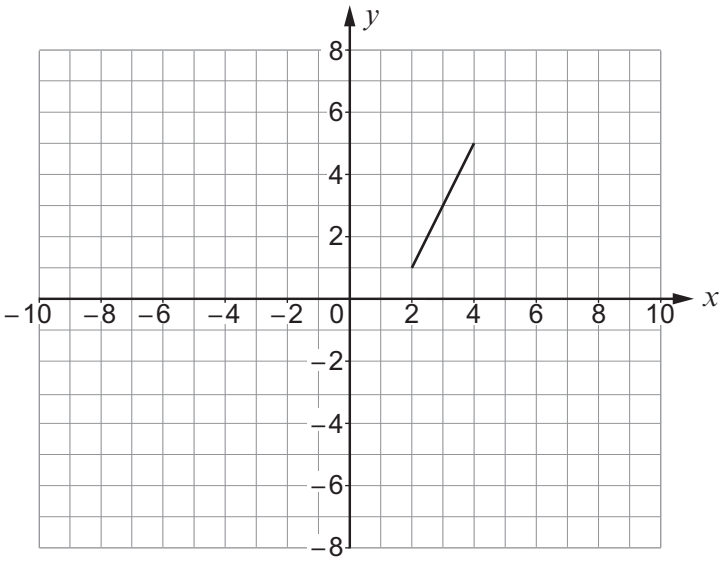


'My shape is a kite. One of the diagonals is shown.
One of the vertices of the kite is at (–5, 4).'

The vertices of the kite are at [2]

(–5, 4), (..... , ...), (..... , ...) and (..... , ...)

(b)



'My shape is a rhombus. The shorter diagonal is shown.
The other diagonal is twice as long as the one I have already drawn.'

The vertices of the rhombus are at [2]

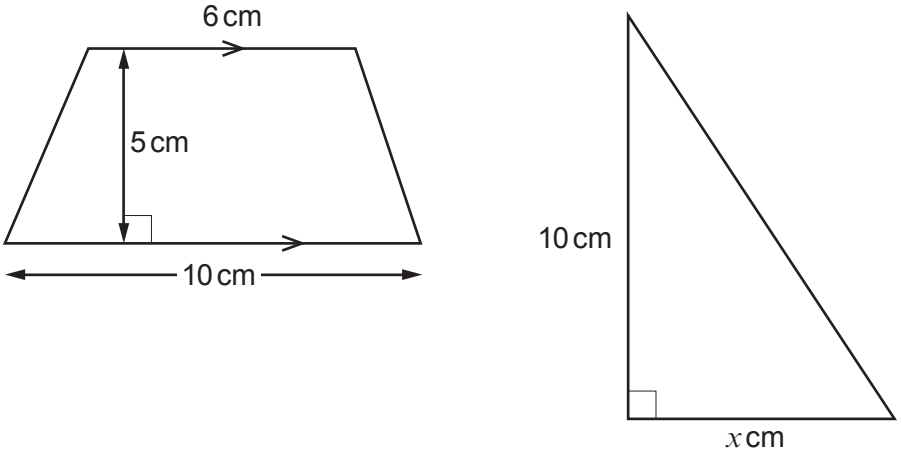
(..... , ...), (..... , ...), (..... , ...) and (..... , ...)

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4. The area of the trapezium is equal to the area of the right-angled triangle.



Diagrams not drawn to scale

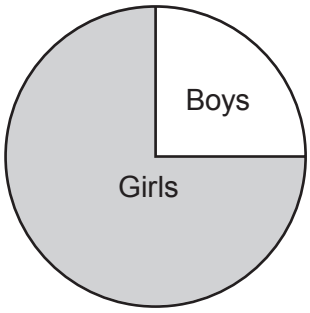
Calculate the value of x. [4]

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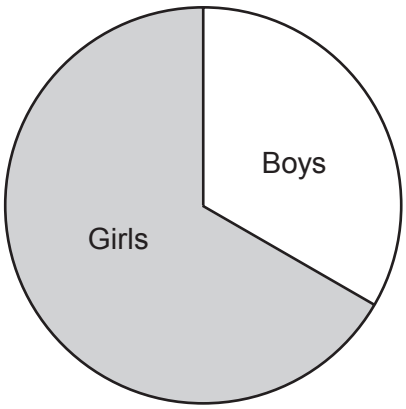
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5. The pie charts show the proportion of boys to girls in class A and class B.



Class A



Class B

There are more pupils in class B than in class A.

There are 4 boys in class A.

There are $1\frac{1}{2}$ times as many girls in class B than in class A.

How many boys are there in class B? [4]

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6. *(a)* Solve $6x - 27 = 4x - 13$. [3]

(b) Solve $\frac{x}{2} + 18 = 26$. [2]

(c) Factorise $y^2 - 5y$. [1]

(d) Expand $y(y^2 + 4)$. [2]

(e) Solve $5x - 6 < 30$. [2]

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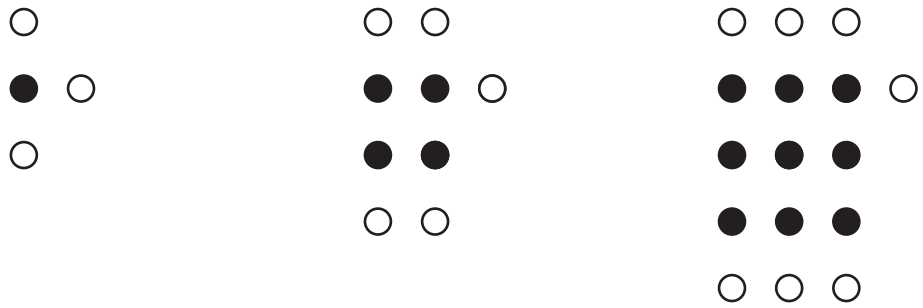
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7. Patterns made with black and white circles are shown below.

Pattern 1 Pattern 2 Pattern 3



Complete the following statements, in terms of n. [3]

'There will be ..... black circles in Pattern n.'

'There will be ..... white circles in Pattern n.'

.....

.....

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8. In the diagram, angles a, b and c are measured in degrees.

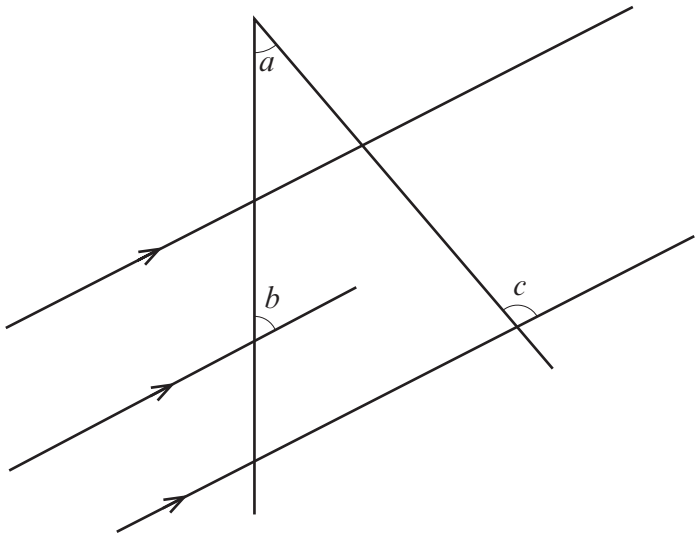


Diagram not drawn to scale

Find the size of angle c in terms of a and b.
You must show all your working, which may be indicated on the diagram. [3]

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9. Amelia regularly buys bird food to place on her bird table.



(a) The winter mix bird food contains buckwheat, millet and sunflower seeds.
For every 2 g of buckwheat there are 3 g of millet and 5 g of sunflower seeds.
How much millet is there in an 850 g bag of winter mix bird food? [2]

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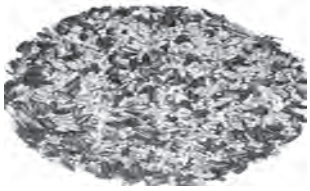
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(b) *You will be assessed on the quality of your written communication in this part of the question.*

The summer mix bird food is sold in different sized bags.
The sizes of the bags and the prices are shown below.



Size	Price
250 g	49p
300 g	54p
4 kg	£7.60

Amelia bought exactly 5 kg of the summer mix bird food.
She found the cheapest option for buying the bird food.

How much did Amelia pay for the bird food?
You must show how many bags of each size Amelia bought.
You must show all your working. [6]

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10. Maggie has lots of tiles.
All of her tiles are in the shape of regular polygons.
The edges of all the tiles have the same length.

She places two 12-sided tiles to meet edge-to-edge.
Maggie places a different-shaped tile with these two tiles.
She finds that the 3 tiles tessellate.

By calculation, find the number of sides of this third tile.
You must show all your working. [5]

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11. Iona and Dafydd went shopping.
They each bought some bottles of the same blackcurrant cordial and the same soda water.
Iona bought 2 bottles of blackcurrant cordial and 3 bottles of soda water.
Dafydd bought 4 bottles of blackcurrant cordial and 1 bottle of soda water.
Iona spent £2.04 and Dafydd spent £2.48.
Use an algebraic method to calculate the cost of a bottle of blackcurrant cordial and the cost of a bottle of soda water. [5]

Cost of a bottle of blackcurrant cordial is .....

Cost of a bottle of soda water is .....

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12. *(a)* Solve $\frac{6+x}{2}+\frac{2-3x}{3}=\frac{31}{6}$. [4]

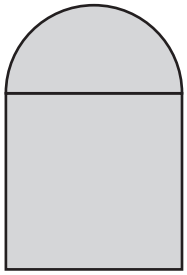
(b) Factorise $2(x+3)^2-4(x+3)$. [2]

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13. *(a)* The diagram shows a semicircle joined to a square.



8 cm

Diagram not drawn to scale

Calculate the total area of the shaded shape, leaving your answer in terms of π. [2]

(b) Evaluate 8^0. [1]

(c) Evaluate $\dfrac{4{\cdot}5 \times 10^8}{9 \times 10^{12}}$, giving your answer in standard form. [2]

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14. *(a)* Last month, Klaus sold his car.
He was the only driver of the car.

His car's data readings for the past year showed that

- he had travelled 3000 miles, correct to the nearest 100 miles, and
- he had spent 80 hours driving, correct to the nearest hour.

(i) Write down the greatest and least values for the time spent and distance travelled by Klaus in his car during the past year, [2]

Distance travelled:

Least distance ..... Greatest distance .....

Time spent:

Least time ..... Greatest time .....

(ii) Write down the calculation Klaus would need to enter into his calculator to work out the greatest value for the average speed reading for his car during these journeys. You do not need to calculate the answer. [1]

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(b) Last week, Klaus bought a new car.

Klaus's first journey in his new car was 60 miles.
This journey was made in a time of 2 hours.
His second journey in his new car was x miles.
This second journey was made in a time of y hours.

The times are correct, but each of the journey distances is only correct to the nearest mile.
Klaus wants to calculate the least value for the average speed for these two journeys combined.

Write down an expression in terms of x and y for the calculation Klaus would have to perform. [2]

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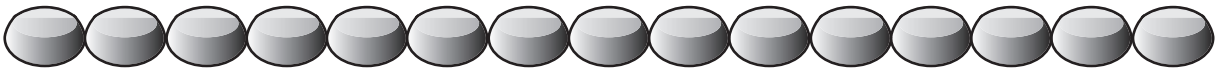
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15.



Fifteen small ceramic pebbles are arranged in a straight row.
Each pebble touches the next pebble in the row.
All of the pebbles are identical in size and shape.
Each of the pebbles has a volume of $2\,cm^3$.

A **similar** larger ceramic pebble is made with a volume of $54\,cm^3$.
A straight row of these pebbles is made in the same way as with the smaller pebbles.

How many of these larger pebbles will be needed to form a straight row equal in length to the row of 15 smaller pebbles?
You must show all your working. [3]

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16. *(a)* Express each of the following as a **decimal**.

(i) $2{\cdot}1 \times 10^{-2}$ [1]

.....

(ii) $400^{-\frac{1}{2}}$ [2]

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(b) Express $\frac{12}{99}$ as a recurring decimal. [2]

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(c) Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{70}$, find the value of abc.

Write your answer in the form $n\sqrt{2}$ where n is a whole number. [2]

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17. Given that y is inversely proportional to x, and that $y = 50$ when $x = 2$,

(a) find an expression for y in terms of x, [3]

(b) use the expression you found in *(a)* to complete the following table. [2]

x	$\frac{1}{2}$	2	
y		50	12·5

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18. The time taken to answer a short questionnaire was measured for each person in a group of 200 ten-year-olds.
The following grouped frequency distribution was obtained.

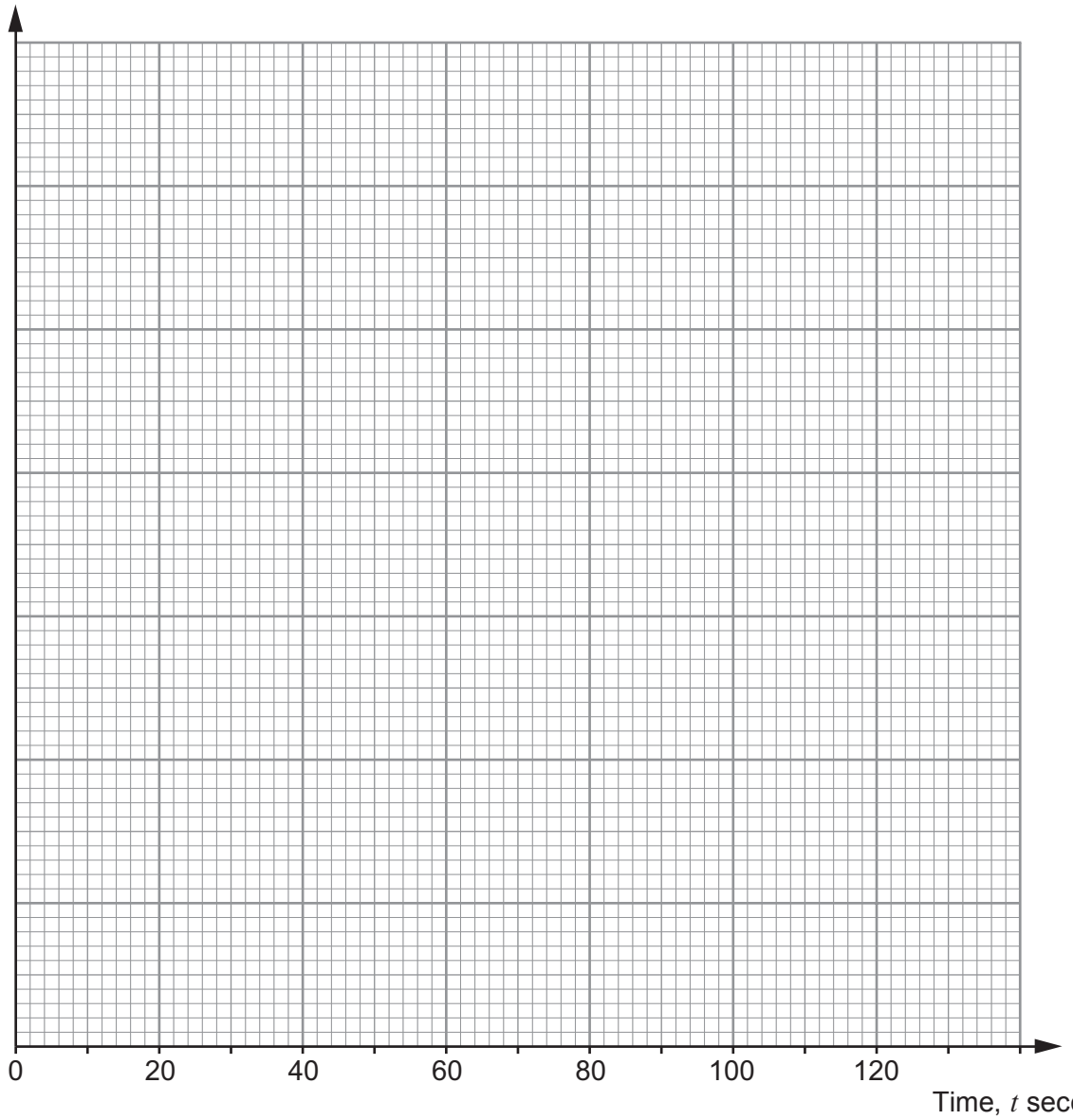
Time, t seconds	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 120$
Number of ten-year-olds	36	44	100	12	8

(a) Draw a histogram to illustrate the distribution on the graph paper below. [4]

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(b) 200 twenty-year-olds were set an identical task.
The times taken to answer the short questionnaire were also recorded using the same time intervals as were used for the ten-year-olds.
The median time taken by the twenty-year-olds to answer the short questionnaire was 58 seconds.

Gemma says,

'The median for the 10-year-olds is the same as the median for the 20-year-olds.'

Fred disagrees. He says,

'The median for the 10-year-olds could be less than the median for the 20-year-olds.'

Explain why either Gemma or Fred could be correct. [2]

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19. Ralph does not like strawberry flavoured chocolates.
In a dark cinema during a film, Ralph selects two chocolates at random from a box.
There are 20 chocolates in the box.
Of these chocolates, 5 are strawberry flavoured.
Calculate the probability that at least one of the chocolates that Ralph selects is strawberry flavoured. [4]

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END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

SUMMER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE MATHEMATICS - LINEAR. 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.

Paper 1 - Foundation Tier	1
Paper 1 - Higher Tier	6
Paper 2 - Foundation Tier	12
Paper 2 - Higher Tier	17

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PAPER 1 - HIGHER TIER

Summer 2014 Paper 1 Higher Tier	Marks	Comments
1(a) 3 values which could lead to simple calculations Correct evaluation for their figures	M1 A1	e.g. $\frac{43.3 \times 50}{200}$, $\frac{40 \times 49.8}{200}$ Do not accept $\frac{43 \times 49}{200}$ Accept decimals OR rounded or truncated answers (*Common responses include10 here)*
1(b) 2	B1	Accept other reasonable estimations, with answer given to no more than 2dp *Allow 2/1*
1(c)(i) 3.9528	B1	
1(c) (ii) 73200	B1	
1(d) 7/2 ×½ OR 7/2 ÷ 2 OR sight of 3/2 + ¼ 1¾ or 1.75 or 7/4 or single value equivalent	M1 A1	e.g. 1.5 + 0.25 CAO
2(a) All points **plotted** correctly	B2	Intention: closer to the correct intersection than to any others B1 for indication of at least 3 correct points *Penalise joining point to point -1*
2(b) Positive	B1	Do not accept descriptions
2(c) Line of best fit with points above and below	B1	The line must be fit for purpose, it should not pass through the intersection of the axes *Ignore also joining point to point*
2(d) Their estimate, from use of their line of best fit, or an answer in inclusive interval 390 ≤ 'their estimate' ≤ 410	B1	Accuracy to the nearest £10 FT for their incorrect line of best fit with accuracy to the nearest £10
2(e) Explanation, that it doesn't tell you, e.g. 'only know how many attend, not how many spent money on ice cream', or 'don't know how many ice creams were sold'	E1	Ignore incorrect statements given with a correct response. Accept answers that state or imply, don't know: • how many ice cream sold, or • how many people bought ice cream Allow answers that state or imply, don't know: • different costs of ice cream (days or ice creams) e.g. accept 'different ice creams cost different amounts', 'don't know who bought what', 'sellers change prices on different days'
3(a) (-1, 4) and (-7, -2) and (-1, 0)	B2	All 3 coordinates correct B1 for any 2 of these 3 coordinates correct *If no marks SC1for correct quadrilateral shown* *Coordinates can be given in any order in the answer space.* *No marks for reversed coordinates.* *However award SC1 for showing the correct points in the quadrilateral*
3(b) (2, 1) and (4, 5) and (-1, 5) and (7, 1)	B2	All 4 coordinates correct B1 for any 3 of these 4 coordinates correct *If no marks SC1for correct quadrilateral shown* *Coordinates can be given in any order in the answer space.* *No marks for reversed coordinates.* *However award SC1 for showing the correct points in the quadrilateral*

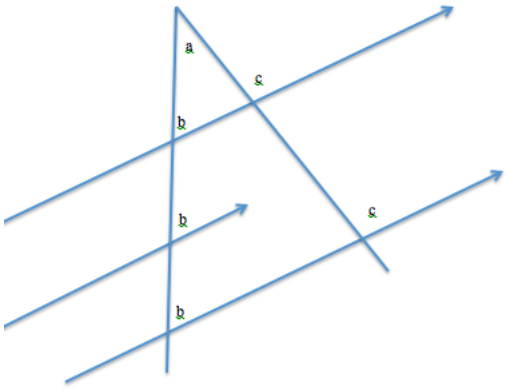
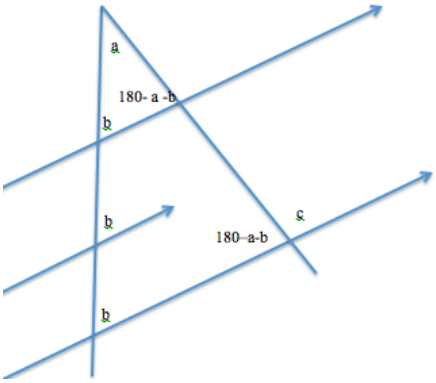
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Summer 2014 Paper 1 Higher Tier	Marks	Comments
4. Area trapezium = ½ × 5 × (6 + 10) = 40 (cm^2) Triangle: ½ × 10 × x = 40 (x =) 8 (cm)	M1 A1 M1 A1	For equating 'their 40' (any value) with ½ × 10 × x FT correct evaluation from 'their 40' (their value) *SC2 for an answer 8(cm) from a two stage method:* *Area trapezium 5 × (6 + 10) = 80 followed by area triangle 10 × x = 80, or* *SC1 for a 2 stage method equating 10 × x with 5 × (6 + 10) with error in calculating x* *A full one stage method 10 × x = 5 × (6 + 10) is correct*
5. Class A has 12 girls Class B has 18 girls There are twice as many girls as boys in class B, or ⅓ of class B boys, or ⅔ of class B girls Class B has 9 boys	B1 B1 B1 B1	 FT 1½ × 'their 12' correctly evaluated (but NOT 1½ × 4) *Sight of 18 implies first B1, B1* OR Class B: Angle girls 240°±2° and angle boys 120°±2° This may be implied from their numbers of girls and boys in class B *Note: ⅓ of 18 does not imply ⅓ of class B boys, hence B0 '18 is ⅔', implies B1* CAO
6(a) 6x – 4x = 27 - 13 2x = 14 x = 7	B1 B1 B1	FT until 2nd error, then stop marking Must be simplified if possible for this final B1 mark
6(b) x/2 = 26 – 18 OR x + 18×2 = 26×2 x = 16	M1 A1	OR alternative full correct method Mark final answer *Accept embedded answer, e.g. 16/2 + 18 = 26*
6(c) y(y – 5)	B1	
6(d) $y^3 + 4y$	B2	B1 a correct term. Mark final answer
6(e) 5x < 36 or 5x < 30 + 6 x < 36/5 or x < 7.2 or x < $7^1/_5$	 B1 B1	 Do not accept '=' FT from 1 error only. Mark final answer *If '=' used but replaced by '<' to give final correct answer, allow B2*
7. n^2 or equivalent (black) 2n + 1 or equivalent (white)	 B1 B2 3	Accept use of N B1 for 2n or equivalent *Penalise use of other letters -1 only*

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Summer 2014 Paper 1 Higher Tier	Marks	Comments
8. An appropriate angle 180 – a – b or 180 –(a+b), or an appropriate b or c angle indicated on the diagram  	B1	Must be shown or stated OR 
(c =) 180 – (180 – a – b) (c =) a + b	M1 A1	Or equivalent rearrangement, e.g. a + b + 180 – c = 180 For answer only (c =) a + b without (or incorrect) working or indication of any appropriate b or c angles award B0, M1 and A1. For answer (c =) a + b with working or indication of any appropriate b or c angles award B1, M1 and A1.
9(a) (Millet) 3 × 850/10 255(g)	M1 A1	CAO

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<table>
<tr><th>Summer 2014 Paper 1
Higher Tier</th><th>Marks</th><th>Comments</th></tr>
<tr><td>9(b)Attempt to find unit cost e.g. for 1kg
(For the 250g bag, 1kg costs) £1.96
(For the 300g bag, 1kg costs) £1.80
(For the 4kg bag, 1kg costs) £1.90

Considering buying 10 or more 300g bags

Working with or choice of 15 of the 300g bags, or 5000÷300 with an answer of 16(.666…), 17 or 16, or trials including 15 or 16 or 17 of the 300g bags

(Cheapest way to buy 5kg is
15 (300g bags) at 54(p) + 2 (250g bag) at 49(p)
= (£)8(.)10 + 98(p))
= (£)9(.)08
Look for
• correct units used
• spelling in at least 1 statement/sentence
• clarity of text explanations
• clearly linking working with size of bag

QWC2: Candidates will be expected to
• present work clearly, with words or quantities shown for clarity of 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 or quantities shown for clarity of process or steps
OR
• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer</td><td>B1

S1

M1

A1

QWC 2</td><td>OR for one correct costing for 5kg
e.g. (£)7(.)60 + 4×49(p) = (£)9(.)56
OR At least 2 combinations of bags to a total of 5kg

OR any 2 correct costings for buying 5kg
OR stating any 3 possible combinations of bags to 5kg
<table><tr><th>250g</th><th>300g</th><th>4kg</th><th>Cost £</th></tr><tr><td>4</td><td>0</td><td>1</td><td>1.96 +7.60 = 9.56</td></tr><tr><td>20</td><td>0</td><td>0</td><td>9.80</td></tr><tr><td>14</td><td>5</td><td>0</td><td>6.86 + 2.70 = 9.56</td></tr><tr><td>8</td><td>10</td><td>0</td><td>3.92 + 5.40 = 9.32</td></tr><tr><td>2</td><td>15</td><td>0</td><td>0.98 + 8.10 = 9.08</td></tr></table>
OR equivalent, e.g. repeated additions or multiples,

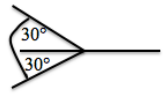
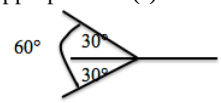
QWC2 Presents relevant material in a coherent and logical manner, using
acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.

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.</td></tr>
</table>

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Summer 2014 Paper 1 Higher Tier	Marks	Comments
10. 12 sided shape: exterior angle 360/12 (= 30°) interior angle (180° - 30° =) 150(°) OR sketch showing one 30° exterior angles, e.g.  	B1 B1	OR M1 Interior 10× 180 ÷ 12 A1 = 150(°) OR B2 for interior angle found to be 150(°)
Gap is 360 – 150 – 150 OR sketch implying the sum of the 2 angles of 30° is the remaining exterior angle, e.g.  	M1	FT for use of 'their 150'
Appropriate 60(°) or sketch showing 60° e.g.  	A1	
Third shape: 3 (sides)	A1	CAO. Allow (equilateral) triangle ***If correct answer with sight of angles:*** Sight of 150(°) or 30(°) AND 60° followed by an answer 3 (sides) or triangle is awarded 5 marks or Sight of 150(°) or 30(°) followed by an answer 3 (sides) or triangle is awarded 4 marks only (as working is incomplete) or Sight of 360(°)/12 followed by an answer 3 (sides) or triangle is awarded 3 marks only (as working is incomplete) ***OR if no working or errors in calculations***: *Award SC2 for an answer of **3 sides** or(equilateral) **triangle**.* *OR* *Award SC2 for a diagram of **a tessellation** of a number of sides of two 12-sided polygons showing a triangle.* *Award SC1 for a diagram of **an attempt at a tessellation** of a number of sides of two 12-sided polygons showing a triangle.*
11. Equations 2b+3s = 2(.)04 and 4b + (1)s = 2(.)48 Method, equating coefficients or alternative First variable correct Method to find second variable Second variable correct	S1 M1 A1 m1 A1	Accept other variables Allow 1 slip, but not in equated coefficients FT their equations in 2 variables provided at least 1 equation is correct **Blackcurrant 54(p) or (£)0.54** **Soda water 32(p) or (£)0.32** *Do not accept trial & improvement, maximum mark S1*
12(a) 3(6 + x) + 2(2 – 3x) = 31 or equivalent -3x + 22 = 31 x = -3	M2 A1 A1	M1 for 2 of these 3 terms correct e.g. 3(6 + x) + 2(2 – 3x) = 31/6 , or for $\frac{3(6+x)}{6} + \frac{2(2-3x)}{6} = \frac{31}{6}$ or equivalent FT from M1 for A1 only CAO (Must be simplified)
12(b) 2(x + 3)(x + 1)	B2	B1 for 2(x + 3)(x + 3 – 2) or (2x + 6)(x + 1) or (x + 3)(2x + 2) or $2(x^2 + 4x + 3)$
13(a) 8×8 + ½× π×4^2 64 + 8π OR 8 (8 + π) (cm^2)	M1 A1	Accept with a value inserted for π ISW. Must be an expression in terms of π *If no marks, SC1 for final answer:* • *use of radius 8 giving 64 + 32π, or* • *full circle included giving 64 + 16π*
13(b) 1	B1	
13(c) 5×10^{-5}	B2	B1 for 0.00005 or 0.5×10^{-4} or 0.05×10^{-3} or similar form

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Summer 2014 Paper 1 Higher Tier	Marks	Comments
14(a)(i) 2950 (miles) 3050 (miles) 79.5(hours) or 79 ½ (hours) or 79 h 30 min 80.5(hours) or 80½(hours) or 80 h 30 min	B2	All 4 correct entries B1 for any 2 correct entries Do not accept 79.3 or 80.3 as 2 correct entries, allow this as equivalent to counting 1 correct entry
14(a)(ii) 3050 ÷ 79.5	B1	FT their greatest distance divided by their least time, provided distance >3000 and time < 80 Accept sight of $\frac{3050}{79.5}$
14(b) $(59 + x) \div (2 + y)$ or $\frac{59 + x}{2 + y}$ (mph) or equivalent unsimplified	B2	OR equivalent with use of minutes, e.g. $\frac{59 + x}{120 + 60y}$ B1 for intention clear but any necessary brackets omitted, or for $\frac{59.5+x}{2 + y}$ or $\frac{60 + x}{2 + y}$ or $\frac{59.5 + x}{120 + 60y}$ or $\frac{60 +x}{120 + 60y}$ *SC1 for sight of 59.5 AND x – 0.5, or for sight of 59+x.*
15. Volume scale factor ×27 Length scale factor ×3 Number of larger pebbles needed (15/3 =) 5	B1 B1 B1	Allow for sight of 54/2 or 27 provided **not** connected to irrelevant working Accept $_3\sqrt{27}$. Allow for sight of 3 provided **not** connected to irrelevant working Award of the 2nd B1 implies also the 1st B1 *SC2 only for an answer of 5 without relevant working*
16(a)(i) 0.021	B1	
16(a)(ii) 0.05	B2	B1 for 1/20
16(b) $0.\dot{1}\dot{2}$	B2	Accept 0.1212… . or dots as for recurring notation Otherwise B1 for 0.12(1…)
16(c) $35\sqrt{2}$	B2	B1 for $\sqrt{70} = \sqrt{2} \times \sqrt{35}$ seen or implied, OR $7\sqrt{5}\sqrt{10}$ or $5\sqrt{7}\sqrt{14}$
17(a) $y \propto 1/x$ OR $y = k/x$ $50 = k/2$ $y = 100/x$	B1 M1 A1	FT non linear only Maybe implied in part (b)
17(b) x: ½ | 2 | **8** y: **200** | 50 | 12.5	B2	FT their non linear expression B1 for each value
18(a) Axis labelled frequency density with a uniform scale from 0 to 5(minimum) Frequency densities 1.8, 2.2, 5, 0.6, 0.2 Correct histogram	B1 M2 A1	Do not accept a scale using less than half the paper or for scales to ≥100 FT for their uniform scale M1 for any 3 correct frequency densities
18(b) Explanation: • Median is in the group $40<t\leq60$ • Estimate so we don't know, or • (Estimate of the) median is 44, or • It (may be) is nearer 40 than 60	 E1 E1	Each E mark is independent. Accept 'median is in same group' Accept 'median could be towards the lower end of the median group'.
19. Idea that need to find P(not strawberry, strawberry) **and** P(strawberry, not strawberry) **and** P(strawberry, strawberry) OR P(not strawberry, not strawberry) then subtract from 1 $\frac{15}{20}\times\frac{5}{19} + \frac{5}{20}\times\frac{15}{19} + \frac{5}{20}\times\frac{4}{19}$ OR $1 - \frac{15}{20}\times\frac{14}{19}$ $\frac{75}{380} + \frac{75}{380} + \frac{20}{380}$ OR $1 - \frac{210}{380}$ OR equivalent $\frac{170}{380}$ (= $\frac{17}{38}$)	S1 M1 A1 A1	Allow selection with replacement for S1 only

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. WEDNESDAY, 6 November 2013

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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.

INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **7**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**4**	
3.	**8**	
4.	**7**	
5.	**4**	
6.	**3**	
7.	**7**	
8.	**5**	
9.	**4**	
10.	**5**	
11.	**3**	
12.	**11**	
13.	**4**	
14.	**2**	
15.	**6**	
16.	**9**	
17.	**5**	
18.	**7**	
Total	**100**	

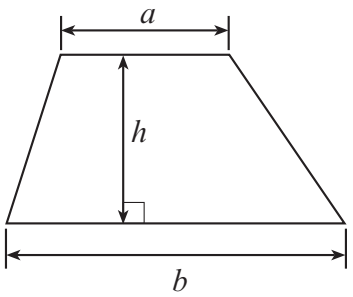
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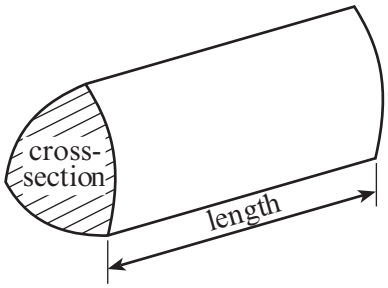
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Formula List

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

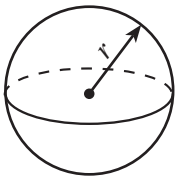


Volume of prism = area of cross-section × length



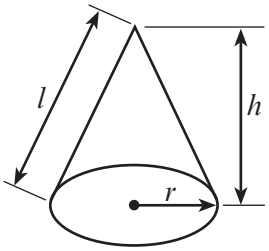
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

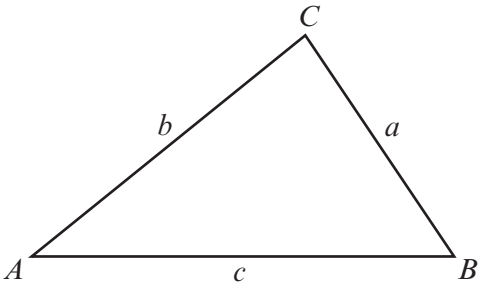


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1. Given that $f = -3$, $g = 2$ and $h = 5$, find the value of the following expressions.

(a) $\dfrac{f^2 - h}{g}$ [2]

(b) $(2h)^3$ [2]

(c) $g - f + \dfrac{1}{h}$ [2]

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Turn over.

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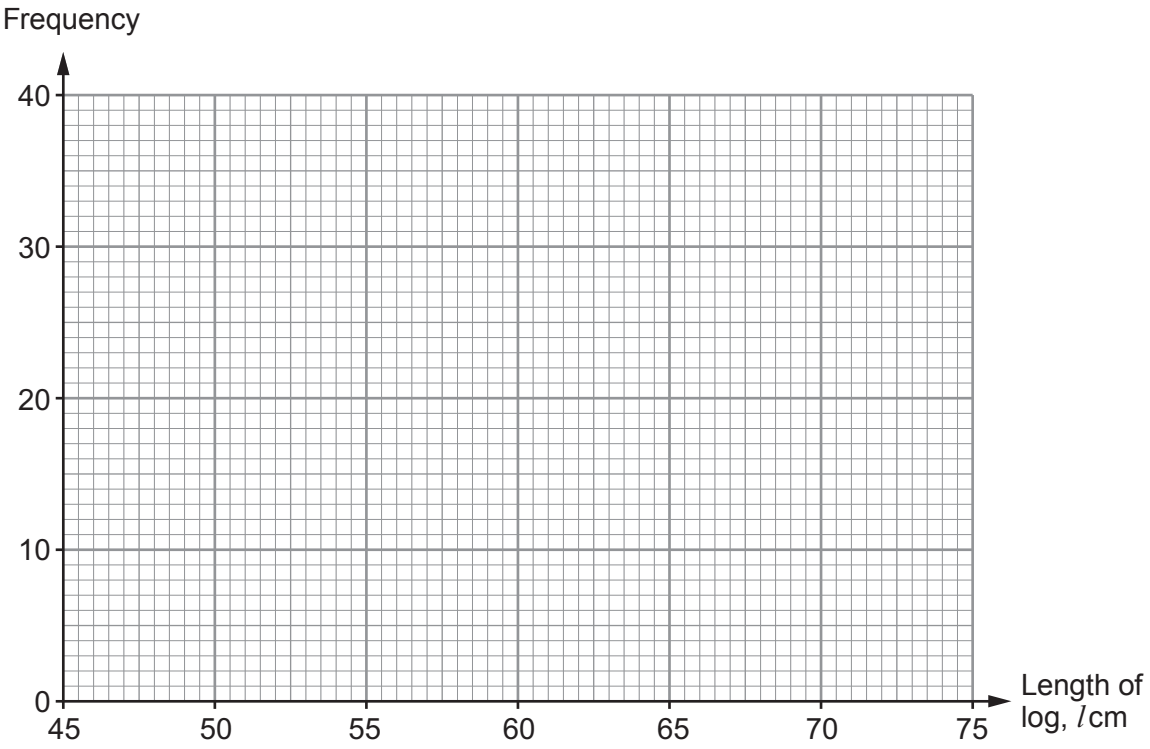
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2. Tom collected 100 logs and measured their lengths in centimetres.

The table below shows a grouped frequency distribution of his results.

Length of log, l cm	$50 < l \leqslant 55$	$55 < l \leqslant 60$	$60 < l \leqslant 65$	$65 < l \leqslant 70$	$70 < l \leqslant 75$
Frequency	4	18	38	30	10

(a) On the graph paper below, draw a grouped frequency diagram to show this data. [2]

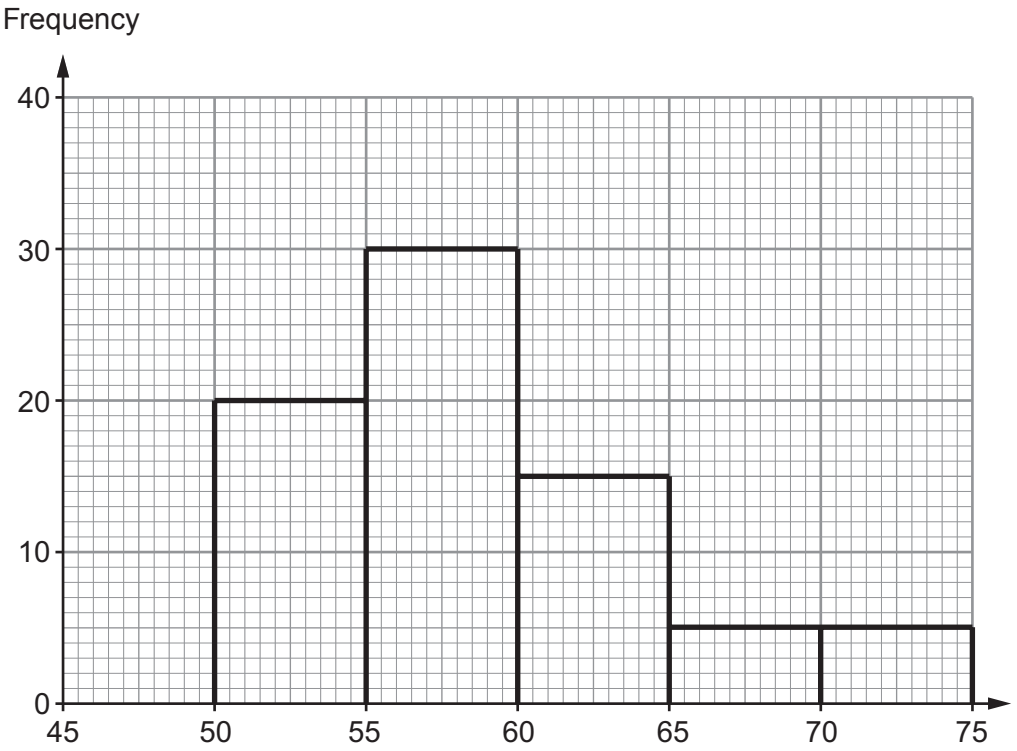


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(b) Billy also collected and measured the lengths of some logs.
The grouped frequency diagram of his results is shown below.



(i) How many logs did Billy collect and measure? [1]

.....

.....

(ii) Was it Tom or Billy who collected the longer logs, on average? [1]

.....

Explain how the grouped frequency diagrams help you to decide.

.....

.....

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3.

Pasta with cheese and asparagus sauce

Serves **4** people

Ingredients:

4 ounces Butter

8 ounces Asparagus

12 ounces Pasta

1 Onion

2 tablespoons Stock

$\frac{2}{3}$ cup Cream

3 ounces Cheese

The recipe in Tamara's cookery book for pasta with cheese and asparagus sauce is shown above.

Information to convert units is also given, as follows:

- 1 cup is approximately 240 ml
- 4 ounces is approximately 115 g
- 1 tablespoon is 15 ml

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(a) Complete the recipe for serving **8 people** using **ml** and **g**. [4]

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Pasta with cheese and asparagus sauce

Serves **8** people

Ingredients:

..... g Butter

..... g Asparagus

..... g Pasta

..... Onions

..... ml Stock

..... ml Cream

..... g Cheese

(b) Tamara has a $\frac{1}{2}$ litre carton of cream.
She has large quantities of all the other ingredients.
Calculate the largest number of portions of pasta with cheese and asparagus sauce that Tamara can make using as much of the cream as possible. [4]

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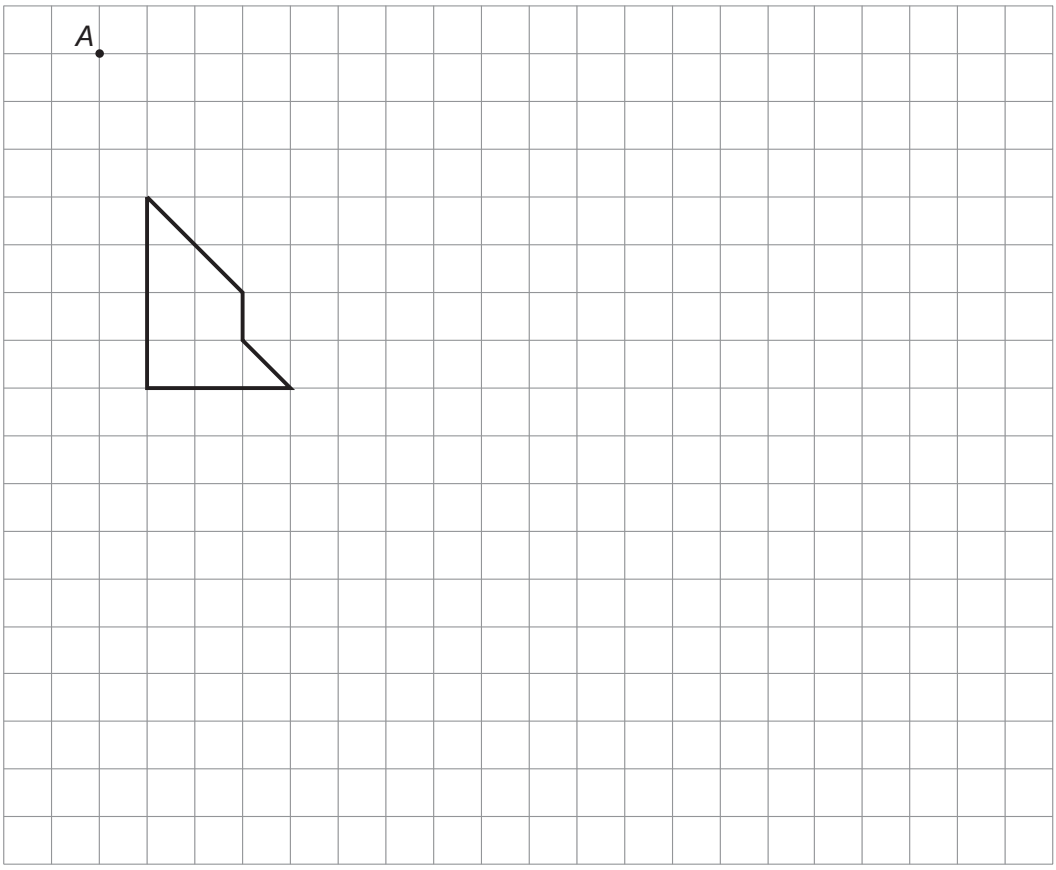
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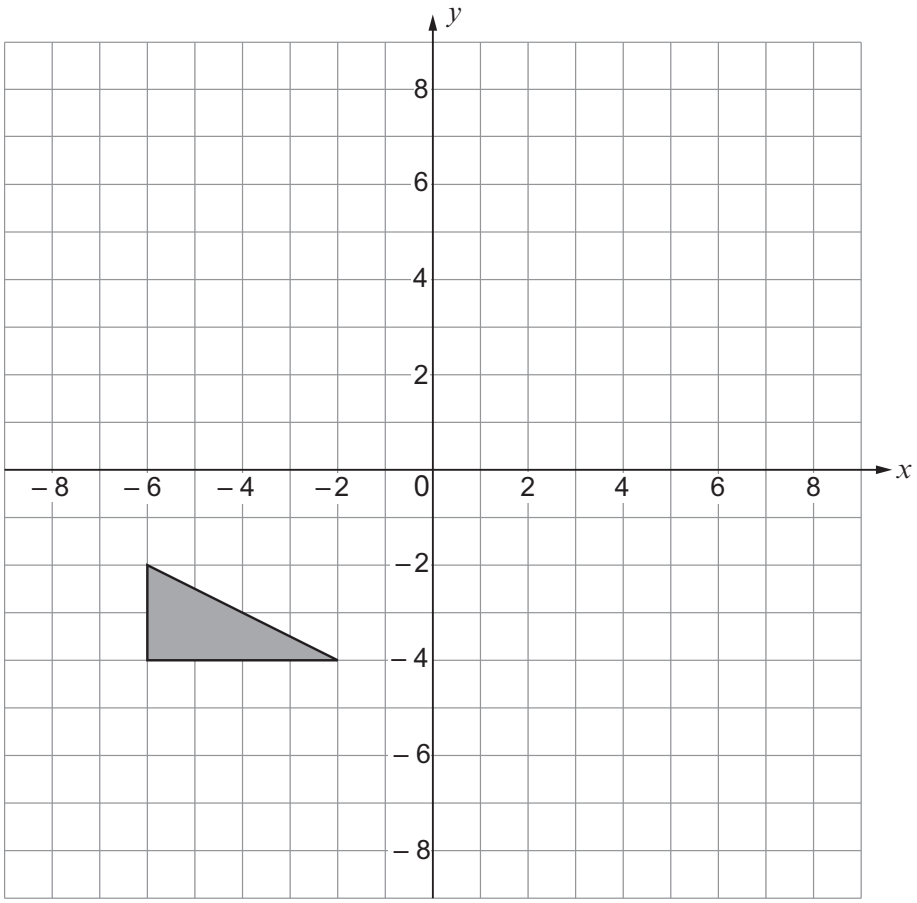
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4. *(a)* Enlarge the shape shown on the grid by a scale factor of 2, using *A* as the centre of enlargement. [3]



(b) Reflect the triangle in the line $y = -x$. [2]

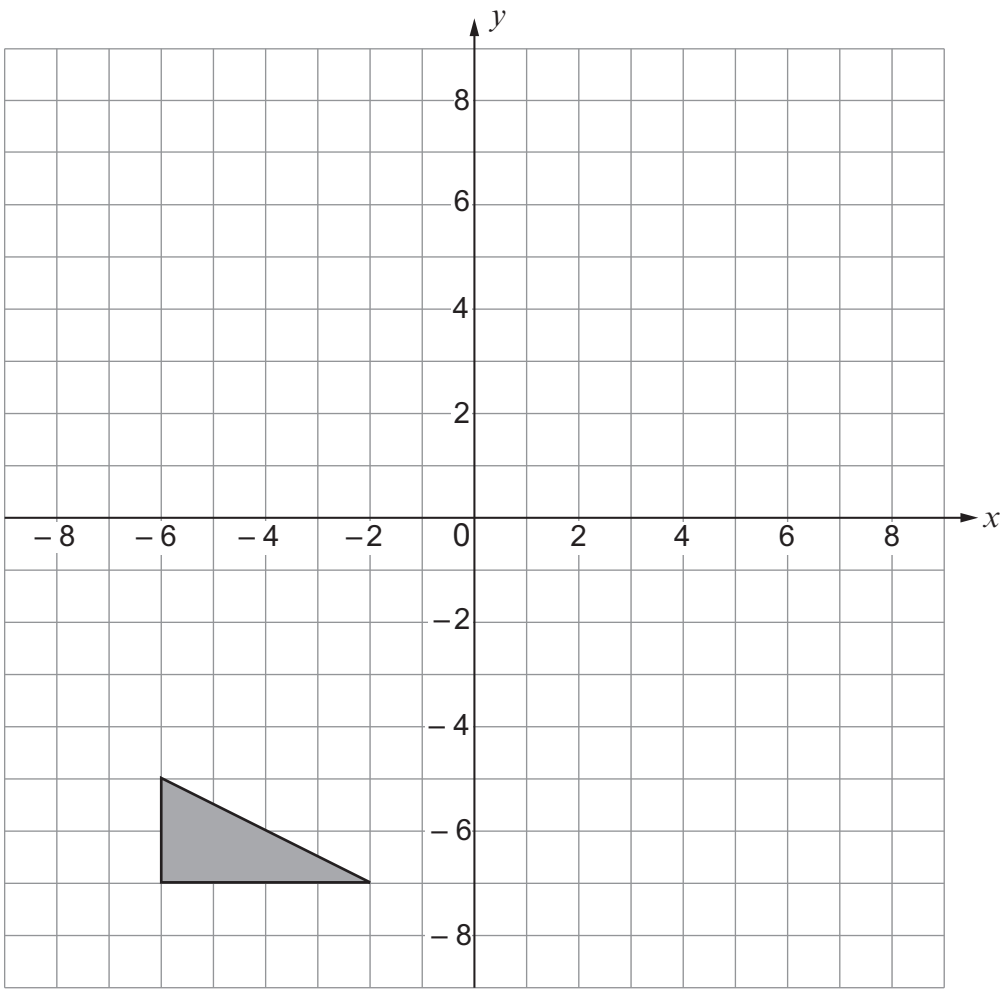


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(c) Rotate the triangle shown on the grid below through 90° anticlockwise about the point (–2, –4). [2]



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5. *(a)* Expand $y(y^5 + 3)$. [2]

(b) Factorise $4x^3 - 2x$. [2]

6. Manilo won some money.
He gave each of his close friends $\frac{1}{24}$ of the money he won.
He kept the remaining $\frac{2}{3}$ of the money for himself.
How many close friends does Manilo have? [3]

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

Dafydd works with his section manager in a department store.



He has a salary of £17 000 per annum and he usually receives a bonus every year.

Dafydd has to make a choice about which bonus to take from those offered by the store this year.

He can either have

- the smaller share when £2500 is shared in the ratio 2 : 3 with his section manager
  or
- a sum of money equal to 6 % of his salary.

Which of these two bonus offers should Dafydd accept?
You must show your working and give a reason for your choice. [7]

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8. Martha is laying out a new design for a flowerbed in her garden, as shown in the diagram below.

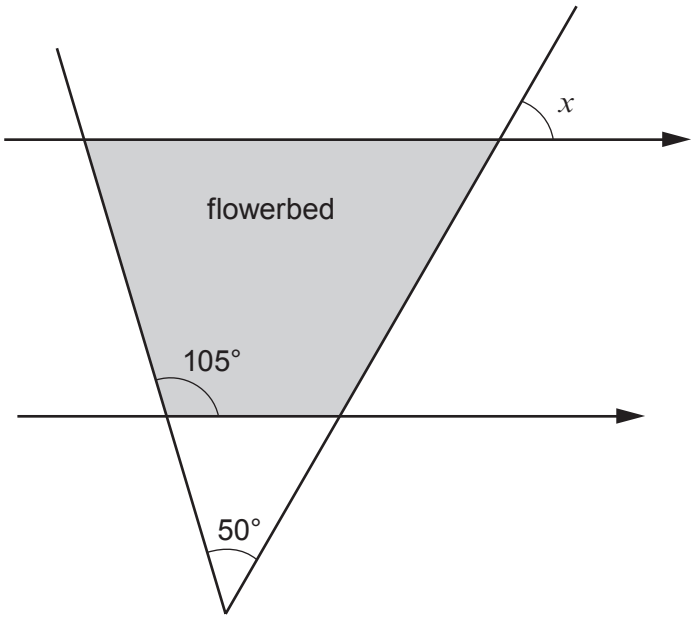


Diagram not drawn to scale

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

.....

.....

.....

.....

$x =$ ..... °

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(b) Martha has another flowerbed in the shape of a parallelogram.

The longer sides measure twice the length of the shorter sides of the parallelogram.
The perimeter of this flowerbed is 24 metres.

Let the length of one of the shorter sides of the flowerbed be z metres.
Form an equation in terms of z.
Solve your equation to find the length of one of the shorter sides of the parallelogram.
[3]

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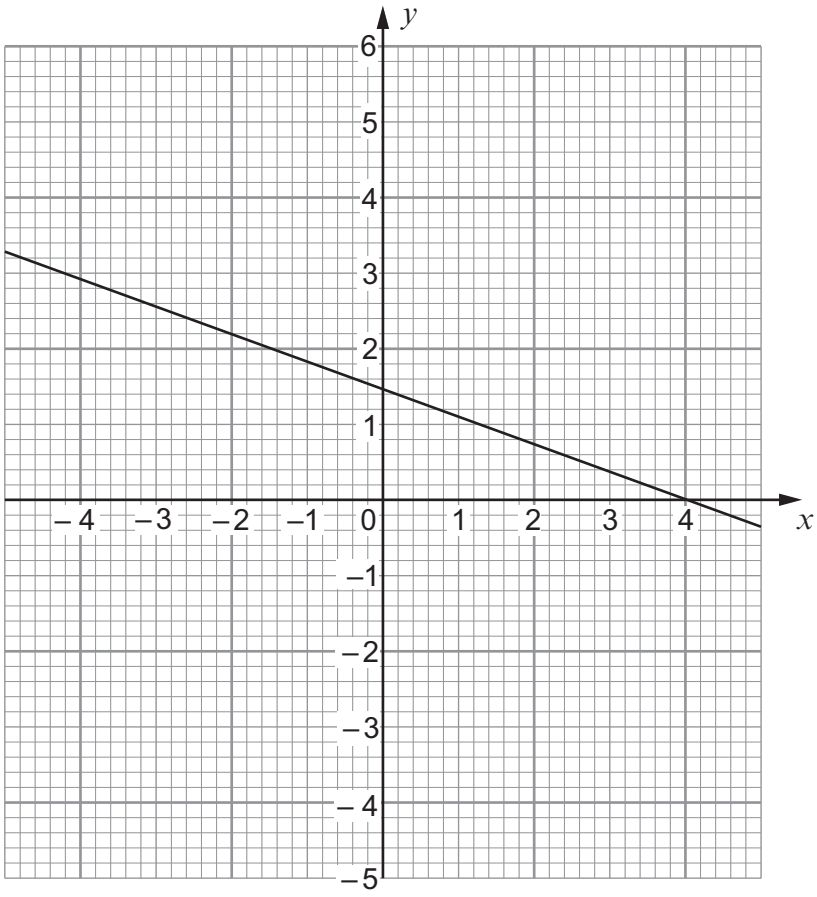
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9. The graph of a straight line is shown below.



(a) You are asked to match one of the equations given below with the straight line.
Put a ring around your choice of equation.
You must show your working **or** give an explanation for your choice of answer. [2]

$y = -4x + 1{\cdot}5$ $\quad$ $1{\cdot}5y = 4x$ $\quad$ $8y = 3x + 12$

$8y = -3x + 12$ $\quad$ $y = 4x + 1{\cdot}5$ $\quad$ $y = -\frac{1}{2}x + 1{\cdot}5$

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(b) Find the coordinates of the midpoint of the straight line which joins (2, –4) and (–2, 6). [2]

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(..... , ...)

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Examiner only

10. *(a)* The nth term of a sequence is $3n^2 + 2n$.
Write down the first three terms of the sequence. [2]

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.....

.....

(b) The nth term of a sequence is $5n - n^2$.
Find the 10th term of the sequence. [1]

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(c) Find the nth term of the sequence $-9, -6, -1, 6, 15, 26, \ldots$ [2]

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11. Harriet invests a sum of money into a savings account that pays compound interest at 3% per annum.
No further deposits or withdrawals are made.

A spreadsheet is used to calculate the total amount, £A, in Harriet's account.
It contains the formula

$$A = 220 \times 1{\cdot}03^{x},$$

where x is the number of years since the investment was started.

(a) How much did Harriet initially invest in her savings account? [1]

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(b) Calculate the amount in Harriet's savings account after 1 year. [2]

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12. *(a)* Factorise $x^2 - 4x - 21$ and hence solve $x^2 - 4x - 21 = 0$. [3]

(b) Solve $\frac{2x+3}{3} + \frac{4x+1}{2} = \frac{43}{2}$. [4]

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(c) Make e the subject of the following formula. [4]

$$\frac{d(2+e)}{5-e} = 3$$

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13. The diagram shows a cylinder.

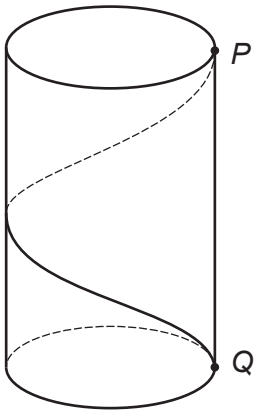


Diagram not drawn to scale

The cylinder has radius r cm and height h cm.

The points *P* and *Q* are on the circumferences at opposite ends of the cylinder.
The point *P* is vertically above point *Q*.

By considering the net of the cylinder, find an expression for the shortest distance from *P* to *Q* when travelling **around** the cylinder.
Give your expression in terms of π, h and r. [4]

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14. A bag of potatoes weighs 3 kg **to the nearest kilogram**.
A sack contains 5 bags of potatoes.

Complete the following sticker to attach to this sack of potatoes. [2]



This sack of 5 bags of potatoes weighs

at least ..... kg

.....

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Turn over.

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15. The table shows some of the values of $y = 4x^3 - 12x^2$ for values of x from -1 to 3.

(a) Complete the table by finding the value of y when $x = -1$ and $x = 1$. [1]

x	-1	$-0{\cdot}5$	0	0·5	1	1·5	2	2·5	3
y		$-3{\cdot}5$	0	$-2{\cdot}5$		$-13{\cdot}5$	-16	$-12{\cdot}5$	0

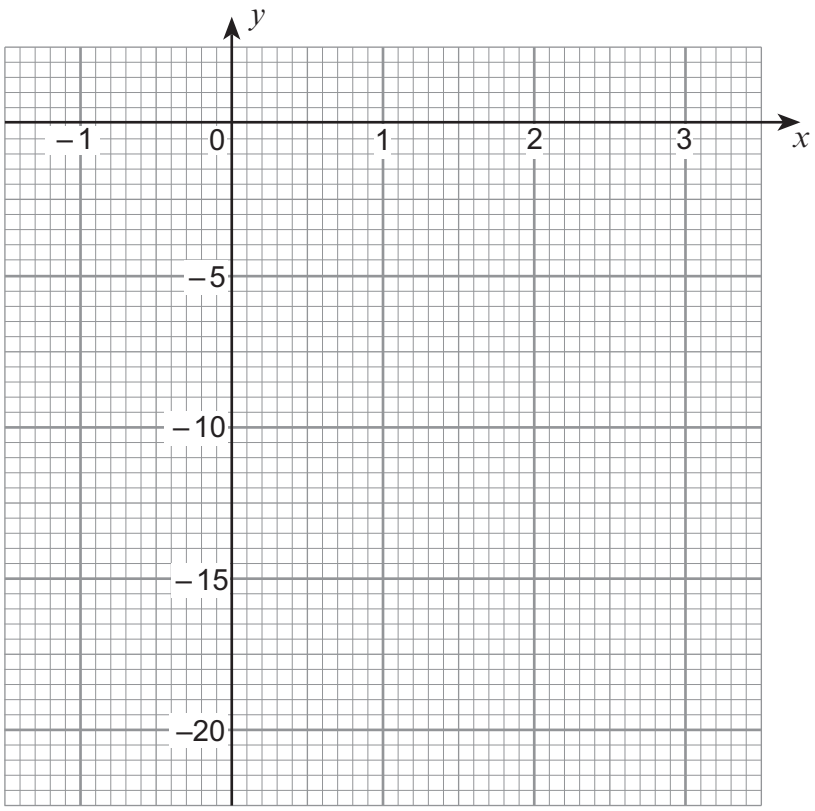
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(b) Using the graph paper below, draw the graph of $y = 4x^3 - 12x^2$ for values of x between -1 and 3. [2]



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(c) Write down the coordinates of the points on $y = 4x^3 - 12x^2$ where the gradient is zero. [1]

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

(d) When the line $y = 8 - 8x$ is drawn between $x = 1$ and $x = 3$, it intersects the curve $y = 4x^3 - 12x^2$ at one point.
Use your graph to find the coordinates of this point of intersection. [2]

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16. *(a)* Express $0\cdot\dot{3}\dot{4}\dot{2}\dot{7}$ as a fraction. [2]

(b) Write down any three values of x for which $x^{\frac{3}{2}}$ is rational. [2]

(c) Give an example of an irrational number

(i) whose square is rational, [1]

(ii) whose square is irrational. [1]

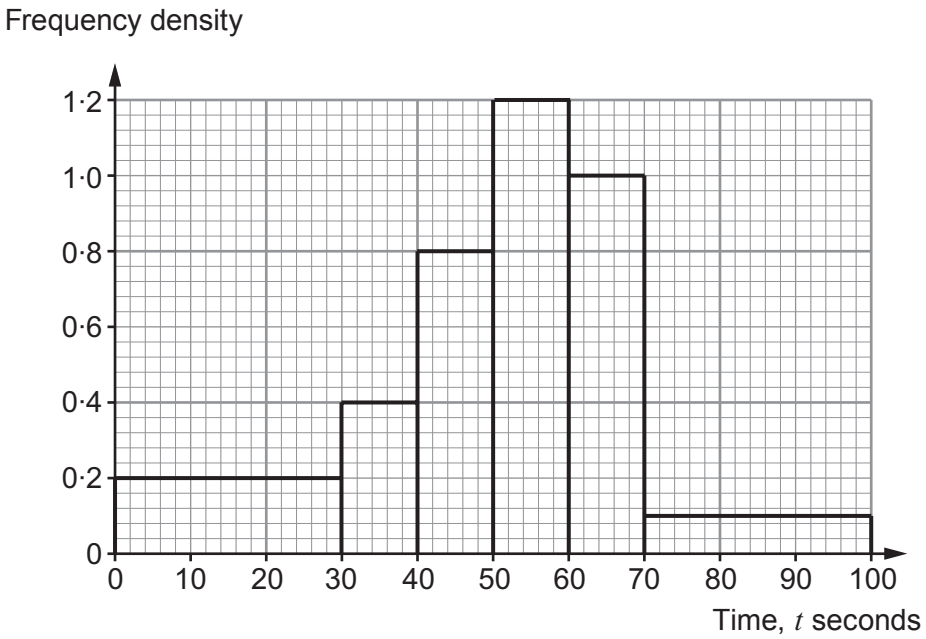
(d) Evaluate $\left(\sqrt{32} + \sqrt{2}\right)^2$. [3]

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17. The histogram shows the times taken by people in a group to climb a set of stairs.



(a) Calculate the number of people in the group. [3]

(b) Calculate an estimate for the number of people who climbed the stairs in less than 65 seconds. [2]

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18. Rhodri has four pairs of shoes.
The colours of the pairs of shoes are red, purple, black and white.
The shoes are kept in a trunk in a dark room.
Rhodri selects two shoes at random.

Calculate the probability that Rhodri selects

(a) two shoes, neither of which is purple, [3]

(b) a matching pair of shoes. [4]

END OF PAPER

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

NOVEMBER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2013 examination in GCSE Mathematics - Linear. 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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PAPER 1 – HIGHER TIER

PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
1(a) $\frac{(-3)^2 - 5}{2}$	M1	Evidence of substitution. Answers of -7, ½ , -5.5 or working towards these answers is evidence of substitution (M1)
= 2	A1	
(b) $(2\times5)^3$	M1	Or sight of $2\times5 \times 2\times5 \times 2\times5$ or $10\times10\times10$ or 10^3
= 1000	A1	
(c) $5^1/_5$ (ISW) or 5.2 or 26/5	B2 6	B1 for $5 + {}^1/_5$. SC1 for $-{}^4/_5$ from 2-3+⅕
2(a) Correct frequency diagram	B2	B1 if translated OR for at least 3 bars correct OR if height correct but slight gaps between the bars If frequency polygon drawn or indication of points at correct heights, B0 in all cases
(b)(i) 75	B1	
(ii) Tom AND a reason, e.g. 'more bars on left for Billy', 'more bars right for Tom', 'Tom collected **more** longer logs', 'Tom has higher number 70 – 75cm logs', 'Tom's mode higher than Billy's'	E1 4	Accept reference to heights. Accept comparison of modal groups Do not accept Tom with statement 'longer logs', 'Tom has 10 logs with length 70-75cm', 'Tom has highest frequency (38, Billy has 30)'
3(a) 230(g) and 460(g) and 690(g)	B1	CAO
2 and 60(ml)	B1	CAO
320(ml)	B1	CAO
172.5(g)	B1	CAO If recipe for 4, treat as MR-1 (115, 230, 345: 1, 30: 160: 86.25)
(b) **Use of** 1 litre = 1000 ml or ½ litre = 500ml	B1	May be implied in calculation, e.g. in working towards (2cups) 480(ml)
8 people needs 320ml so need 320 ÷ 8 ml per person	M1	FT 'their 320' throughout OR 4 people 2/3 ×240 (ml) so 2/3 ×240 ÷4 OR 500÷ 'their 320' considered or shown as repeated addition or multiplication trials **towards** 500
40 ml per person or 12.5 people	M1	Allow for an answer of 13 from appropriate working OR if trials or repeated addition has been used, must work to consider how 'their 320' can be broken down into a smaller quantity per person
12 portions	A1 8	(Note: FT from cream 160ml gives 25 people) Unsupported answer of 12 (people) is awarded all 4 marks
4(a) Enlargement scale factor 2	B2	B1 for any 3 lines correct, or consistent incorrect scale
Correct position	B1	
(b) Correct reflection in $y = -x$	B2	B1 for a reflection in $y = x$, OR for sight of the line $y = -x$ *Answer coordinates at (2, 6), (4, 6), (4, 2)*
(c) Correct rotation	B2 7	B1 for a 'near miss' slightly off the grid lines, OR 90° clockwise rotation about (-2, -4) *Answer coordinates at (1, -4), (1, -8), (-1, -8)*
5(a) $y^6 + 3y$ as a single expression	B2	B1 for each term. If B2 penalise further working -1 Do not accept $y\times y^5$ for y^6. Do not accept $3\times y$ for 3y, Allow y3 for 3y
(b) $2x(2x^2 - 1)$	B2 4	B1 for correct but only partially factorised OR $2x(2x^2$ .....) or 2x(..... -1)
6.Realising that 1/3 of the winnings is given away AND considers equivalent fractions in …/24	S1	Or sight of 1/3 = …/24 or realising ⅔ is 16/24 OR accept appropriate working with an amount of money
8 (close friends)	B2 3	B1 for an appropriate calculation that could lead to 8 people or 16 (left) OR sight of 16/24 or 8/24 Examples of calculations: 24-16, or 2×24/3 (=16 left) An unsupported correct answer is awarded all 3 marks.

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
7. (Ratio bonus) (1 share) (£)2500÷5 (2 shares is 500 × 2 =) (£)1000 (Percentage option) (6% of £17000 =) 0.06×(£)17000 = (£)1020 Valid reason based on working, e.g. '6% option because it is more money', or '6% option as it is £20 more' Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £, p) QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 E1 QWC 2 7	Alternative method to find 1% (÷100) then 6% (× 6) FT from their two values provided both M marks awarded, must be based on two values to compare 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) 55 (b) 2z + z + 2z + z = 24 (or 6z = 24 or 3z = 12 or 2z=24/3) 6z = 24 (or z = 24/6 or z = 12/3) (z=) 4 (metres)	B2 M1 A1 B1 5	B1 for evidence of 180 – (75+ 50) or equivalent, e.g. 360 –(105 + 125+75) incorrectly calculated, accept without brackets as intention, e.g.180 - 75 + 50, OR for sight of 55(°) or 125(°) from appropriate working or on the diagram **Must be evidence of a correct equation** , not z = 4 Do not penalise change of letter from z An answer only (z =) 4 without an introductory equation is M0, A0, B1. Accept answer 4 (metres) without equation *SC1 for z+z+z+z=24 or 4z=24 leading to z=6, or 2z+2z+2z+2z=24 or 8z=24 leading to z=3, z+2z = 24 leading to z = 8* ***or similar***
9(a) Selecting 8y = -3x + 12 Either shows y = -(1.5/4) x + 1.5 or shows trials, within 8y=-3x+12 knowing that (0, 1.5) or (-4, 3) **and** (4, 0) lie on this line or appropriate elimination of all other equations (b) (2 + -2)/2 or (-4 + 6)/2 (0, 1)	B1 E1 M1 A1 4	SC1 for selection of 8y = 3x + 12 with some attempt at a reason (e.g. elimination of other equations) Do not accept 'the one that works' without saying why? Do not accept 'negative gradient', as this is insufficient OR attempt sketch with reasonable **idea of mid point** (not when giving intersection as a response) *Watch for, and accept the use of (a) graph paper* *(Watch for (0,2) without working or from incorrect working this is M0, A0)*
10(a) 5, 16, 33 (b) -50 (c) n^2 - 10	B2 B1 B2 5	Ignore any further values given B1 for 2 correct terms in the correct position SC1 for 0, 5, 16 or …, 5, 16, 33 CAO Mark final answer B1 for $n^2 \pm$ …, not for n^2 alone, written within an expression of at least 2 terms B0 for $an^2 \pm$ … where $a \neq 1$

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
11(a) (£)220 (b) 220×1.03 (£)226.6(0)	B1 M1 A1 3	 FT 'their 220' from (a) Alternatively finding 3% and adding to 220 CAO. ISW
12(a) (x + 3)(x - 7) x = -3 and x = 7 (b) 2(2x + 3) + 3(4x + 1) = 129 16x + 9 = 129 x = 120/16 (=7.5) (c) 2d + de = 15 – 3e de + 3e = 15 – 2d e(d + 3) = 15 – 2d $e = \frac{15 - 2d}{d + 3}$	B2 B1 M2 A1 A1 B1 B1 B1 B1 11	B1 for (x -3)(x +7) or x(x-7)+3(x-7) or equivalent FT from their pair of brackets, or from previous B1 Do not accept answer only, must FT from factorising For correctly clearing all 3 fractions, OR M1 for clearing 2 fractions FT from M1 Accept 240/32. Ignore incorrect cancelling SC1 provided no other marks awarded for $\frac{16x+9}{6}$ (= $\frac{129}{6}$) FT until 2nd error for equivalent level of difficulty Mark final answer
13. Shows understanding of the distance PQ around the cylinder, as straight line PQ^2 = circumference^2 + h^2 $PQ^2 = (2\Pi r)^2 + h^2$ (PQ =) $\sqrt{((2\Pi r)^2 + h^2)}$ or $\sqrt{(4\Pi^2 r^2 + h^2)}$	S1 M1 A1 A1 4	E.g. shows a rectangle with PQ as the diagonal Allow split into 2 diagonals straight lines Allow application of Pythagoras' Theorem as FT from a split into 2 diagonals Accept $PQ^2 = 2\Pi r^2 + h^2$ as idea for method No further FT from split diagonals
14. 12.5(kg)	B2 2	B1 for sight of 2.5(kg)
15(a) – 16 and -8 (b) At least 4 points plotted accurately All **9** points plotted accurately and joined with a curve (c) (0, 0) (2, -16) or follow through from their graph (d) y = 8 – 8x drawn accurately and intersecting the curve Coordinates of the point of intersection	B1 M1 A1 B1 M1 A1 6	 FT from (a) Plots reasonable for the scale and the intention for the curve to pass through all of the points plotted Need both points where gradient is zero FT from consistent misread of the scale if possible FT from their curve if possible Reasonable for their graphs, reading accurate to gridlines Accept with missing brackets Accept unsupported answers (2.5, -12.5) to (2.5, -12)
16(a) Attempt to find the difference between 100x=34.2727… and x = 0.342727… 3393/9900 (b) Any 3 correct responses, e.g. 0, ¼ , 1/9, 1, 4, 9, 16, 25,.. (c)(i) Correct response, e.g. √2, √3, √½ , √5, √21, .. (ii) Correct response, e.g. Π, √Π, $_3\sqrt{2}$, $_5\sqrt{7}$, … (d) $(\sqrt{(2\times16)} + \sqrt{2})^2$ $(4\sqrt{2} + \sqrt{2})^2$ $(= (5\sqrt{2})^2)$ 50	M1 A1 B2 B1 B1 M1 A1 A1 9	Or differences with correct values for 10000x and 100x, or 1000x and 10x, or alternative full method, or sight of 33.93/99, 339.3/990 ISW Accept if consistently written with index 3/2 Accept if more than 3 responses offered if all are correct B1 for any 2 correct responses with no more than 1 incorrect response If an incorrect response offered with a correct response, B0 Do not accept √Π OR M1 $32 + \sqrt{32}\sqrt{2} + \sqrt{32}\sqrt{2} + 2$ any 3 terms correct A1 $32 + 8 + 8 + 2$ CAO A1 50
17(a) Strategy, finding area 0.2×30 + 0.4×10 + 0.8×10 + 1.2×10+ 1.0×10+ 0.1×30 43 (people) (b) 6+4+8+ 12 + ½×10 OR 43 – 3 – ½×10 35 (people)	M1 M1 A1 M1 A1 5	Any single area is sufficient (Note for markers: 6+4+8+12+10+3) CAO FT 'their 43'

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
18(a) P(not purple, not purple) with sight of 6/8 OR sight of an alternative full strategy	B1	Not for sight of 6/8 alone, i.e. as 6 non purple shoes out of 8 shoes Allow B1 for sight of 6/8 × 5/8
6/8 × 5/7 or alternative full calculation shown	M1	
30/56 ISW (15/28)	A1	
(b) P(RR)+P(PP)+P(BB)+P(WW)	B1	OR 1 – P(2 different colours) OR P(any shoe) × P(its matching shoe)
Sight of 2/8 × 1/7 in appropriate working	B1	OR 8/8 × 1/7
4 × (2/8 × 1/7) or equivalent	M1	OR 8/8 × 1/7
1/7	A1	OR equivalent fraction
	7	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. TUESDAY, 11 June 2013

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

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**.

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

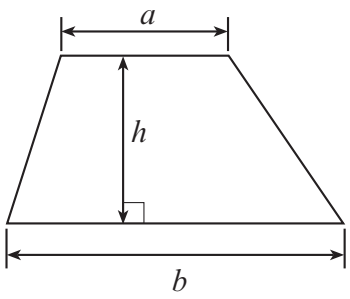
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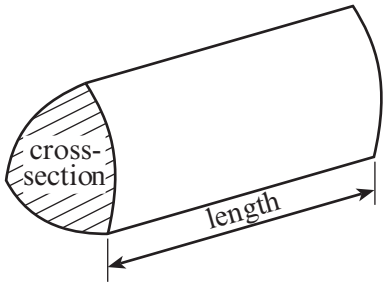
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Formula List

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

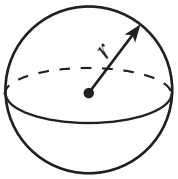


Volume of prism = area of cross-section × length



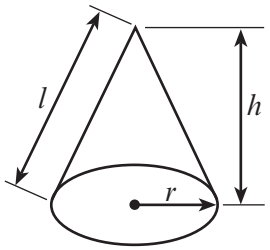
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

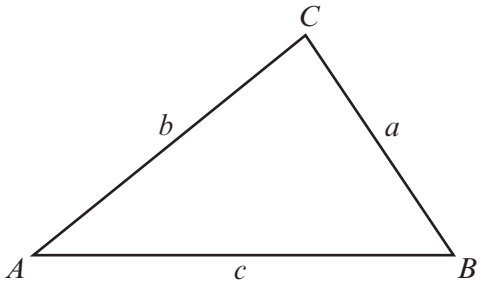


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1.

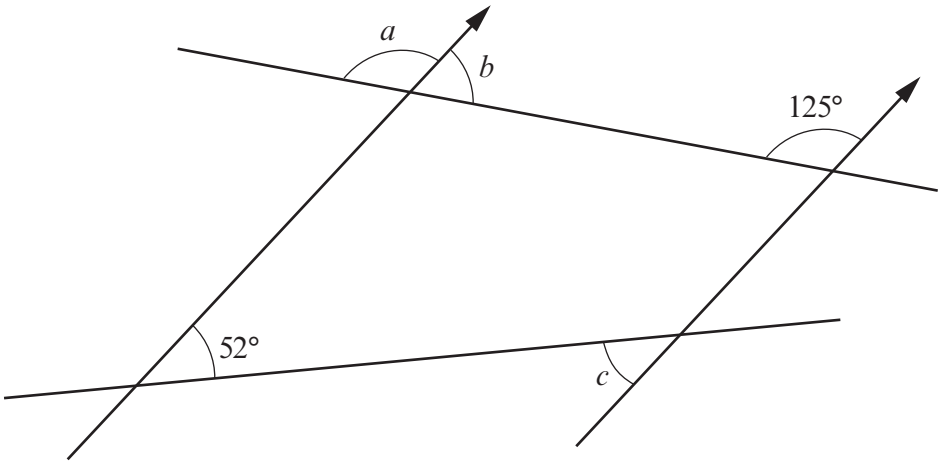


Diagram not drawn to scale

Find the size of each of the angles a, b and c.

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.....

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a = ... ° b = ... ° c = ... °

[3]

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Turn over.

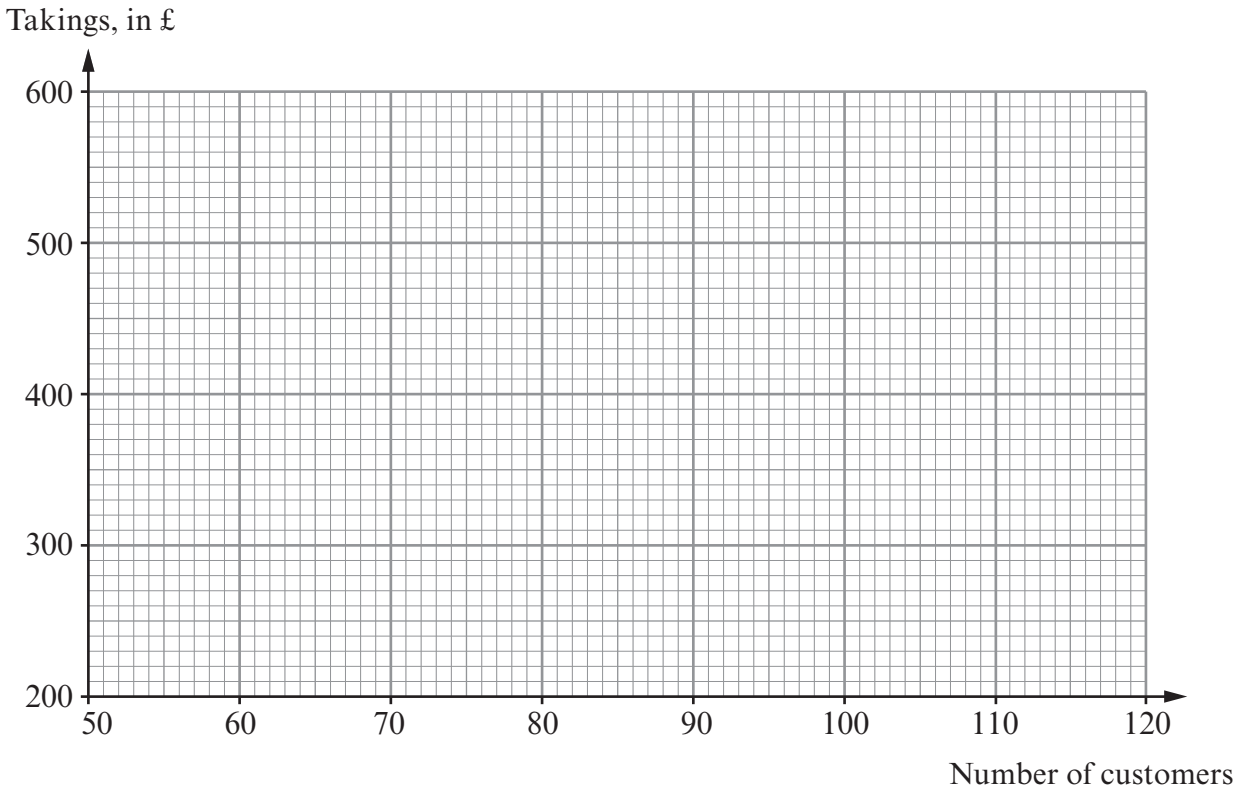
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2. Every Friday for 6 weeks, the number of customers entering a sandwich shop and the takings of the shop were recorded.
The takings were recorded correct to the nearest £10.
The table below shows the results.

Number of customers	104	82	120	64	70	118
Takings, in £	510	420	590	320	340	560

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



[2]

(b) Write down the type of correlation that is shown by the scatter diagram.

.....

[1]

(c) Draw, by eye, a line of best fit on your scatter diagram.

[1]

(d) Estimate the takings for a Friday when there are 90 customers.

.....

[1]

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(e) Approximately how much does a customer spend, on average, in the sandwich shop on a Friday?

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[2]

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3. Two types of banana are available to buy, Fairtrade and non-Fairtrade.
Each type of banana costs 30p.
The table below shows how the 30p is shared for each type of banana.

	Non-Fairtrade	Fairtrade
Grower	2p	15p
Plantation owner	5p	2p
Wholesale importer	3p	2p
Shipper	4p	3p
Ripener	4p	2p
Seller	12p	6p
Total	30p	30p

(a) Calculate the percentage of the cost of a banana that goes to the seller under

(i) non-Fairtrade,

.....

.....

.....

[2]

(ii) Fairtrade.

.....

.....

.....

[1]

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(b) A newspaper report states that the Grower gets too small a proportion of the price of a non-Fairtrade banana. Explain, using fractions, how this has improved with the move to producing Fairtrade bananas.

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.....

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[2]

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4. In answering this question, you must show all your construction arcs.
Use a ruler and a pair of compasses to construct an angle of 45° at the mid-point of the straight line below.
Label your angle 45°.

[3]

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

Pedro has just moved to live on an island in Europe.
There is a choice of two different water companies.

Manana Water

No Standing Charge

Pay €0.06 per m^3 of water used

Channel Water

Standing Charge: €30 every 3 months
+
€0.02 per m^3 of water used

Special offer: 20% off your **first** bill

Pedro estimates that he uses 700 m^3 of water every three months.
He wants to spend as little as possible on water.
Which company should Pedro buy his water from?
You must justify your answer by showing all possible costs.

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[9]

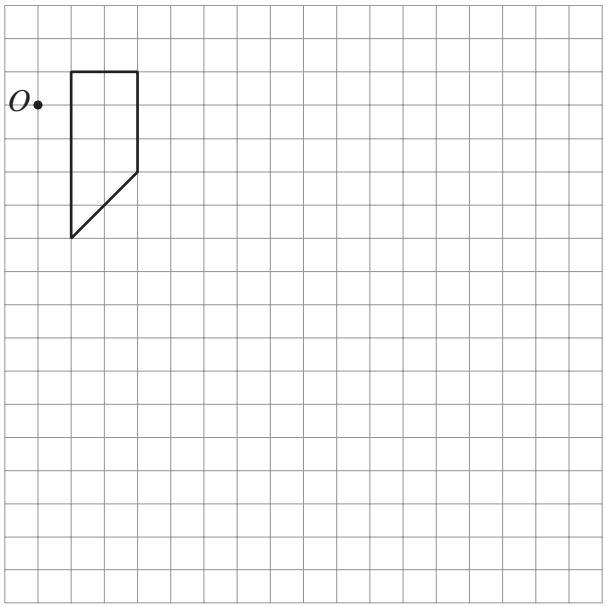
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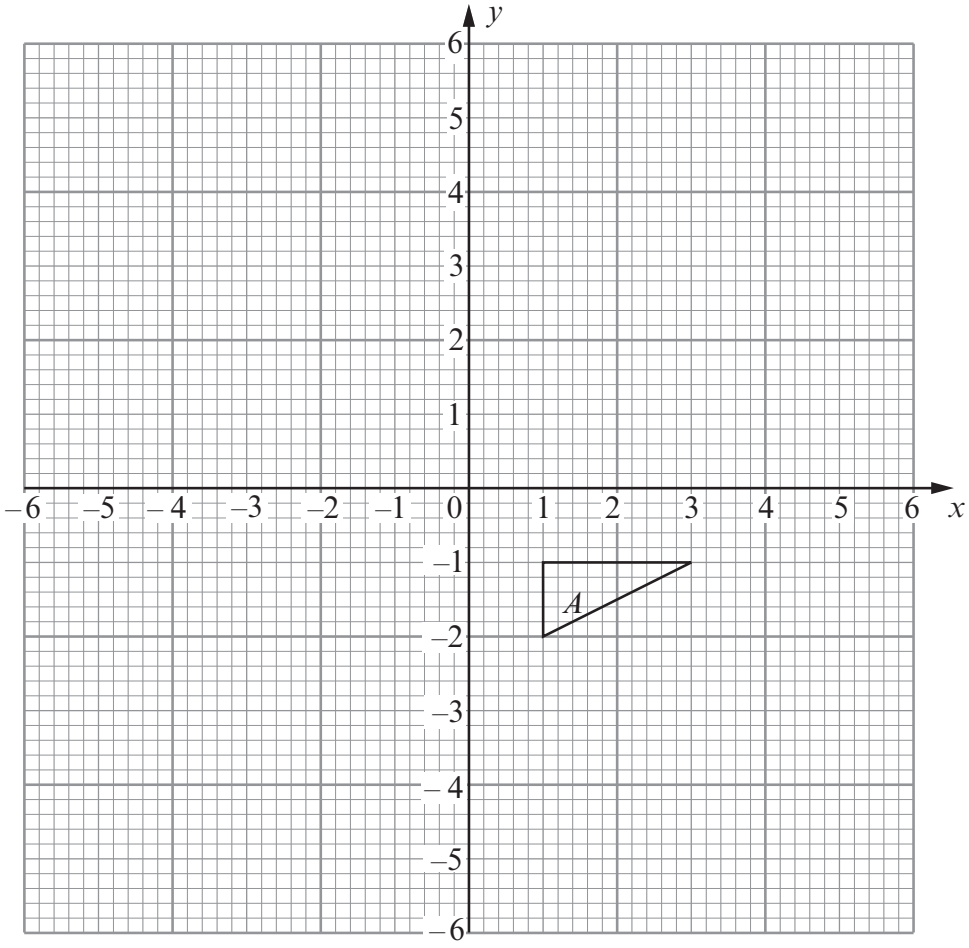
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6. *(a)* On the grid below, draw an enlargement of the trapezium using a scale factor of 2 and centre *O*.



[3]

(b) Rotate the triangle *A* through 90° anticlockwise about the point (–1, –2).



[2]

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7.

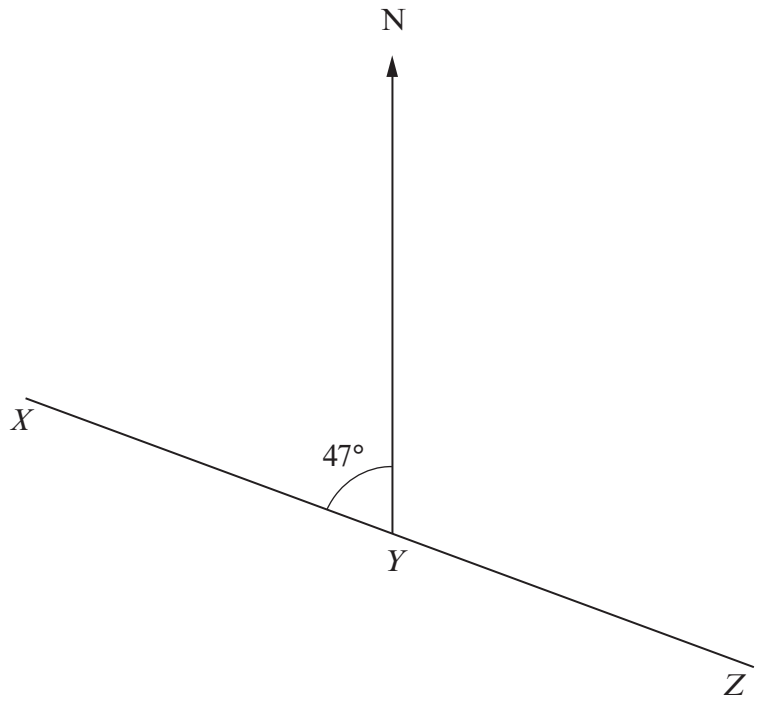


Diagram not drawn to scale

The above diagram shows three points X, Y and Z which lie on a straight line.

Calculate the bearing of

(a) Z from Y,

.....

.....

[1]

(b) X from Y.

.....

.....

[2]

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8. *(a)* Find the highest common factor of 90 and 105.

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[2]

(b) Find the lowest common multiple of 90 and 105.

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[2]

(c) Express 936 as a product of prime numbers in index form.

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.....

[3]

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9. A company is making cylinders to package plastic rods.
Each cylinder is made using a rectangular piece of card and two circular pieces of metal.
The net of one of these cylinders is shown below.

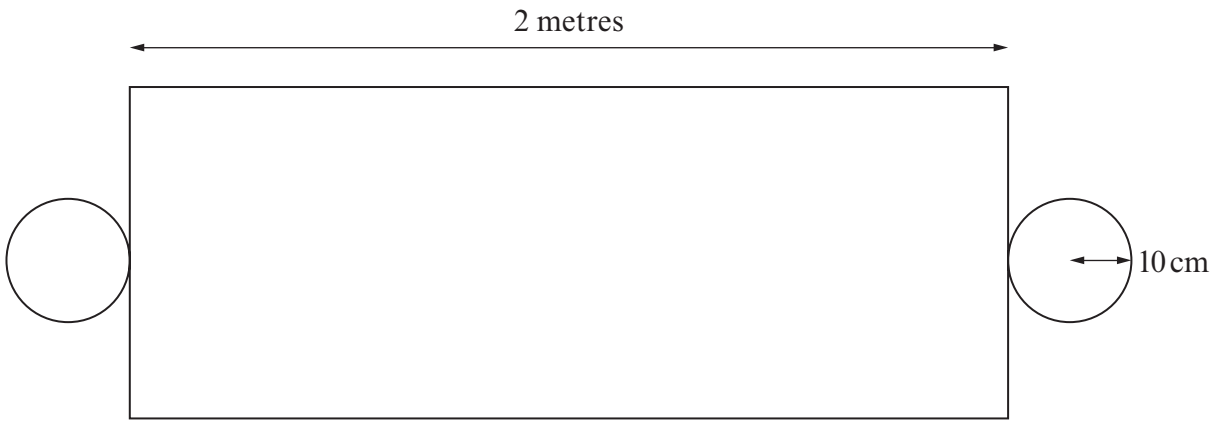


Diagram not drawn to scale

The radius of each circular end is 10 cm.
The cylinder is of length 2 metres.
Taking $\pi = 3{\cdot}14$, calculate the **area of the rectangular piece of card**.
State the units of your answer.

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[5]

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Turn over.

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10. Rearrange the following formulae to make y the subject.

(a) $y^2 - t = g$

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[2]

(b) $\dfrac{3y + w}{2y + 3} = 5$

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[4]

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11. The diagrams show how 12 small identical rectangles can be placed to form a larger rectangle in two different ways.

Diagram 1

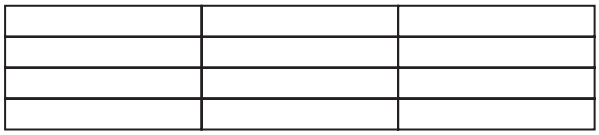
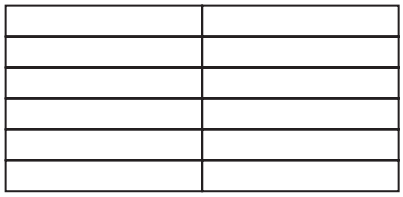


Diagram 2



Diagrams not drawn to scale

The perimeter of each of these diagrams is measured.
The perimeter of diagram 1 is 55 cm.
The perimeter of diagram 2 is 50 cm.

Find the dimensions of one of the 12 small identical rectangles.

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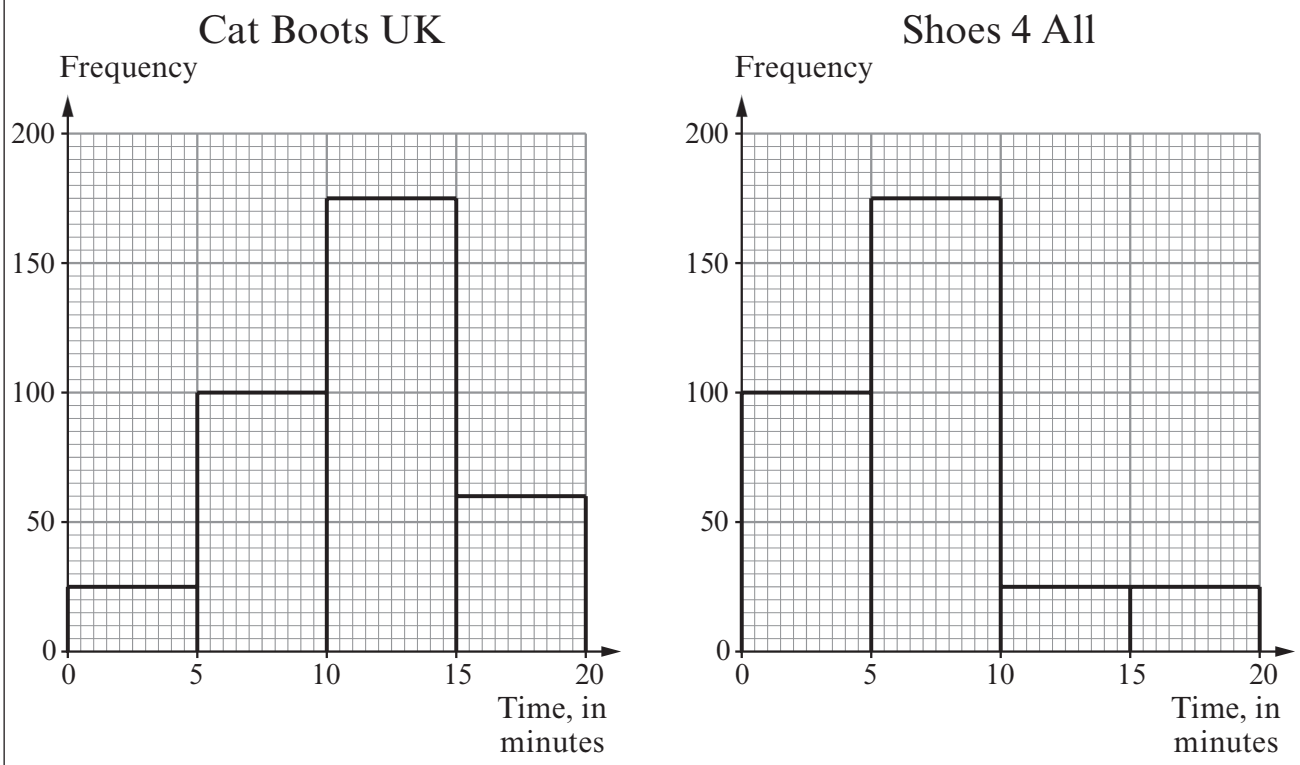
[5]

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12. The frequency diagrams show the lengths of telephone calls taken by two online shopping companies one day in November.



(a) How many calls to Cat Boots UK lasted between 5 minutes and 15 minutes?

.....

.....

[1]

(b) Which company had longer calls on average on this day?
Give a reason for your answer.

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[1]

(c) Complete the cumulative frequency table for Cat Boots UK times.

Time t, in minutes	$t \leqslant 5$	$t \leqslant 10$	$t \leqslant 15$	$t \leqslant 20$
Cumulative frequency				

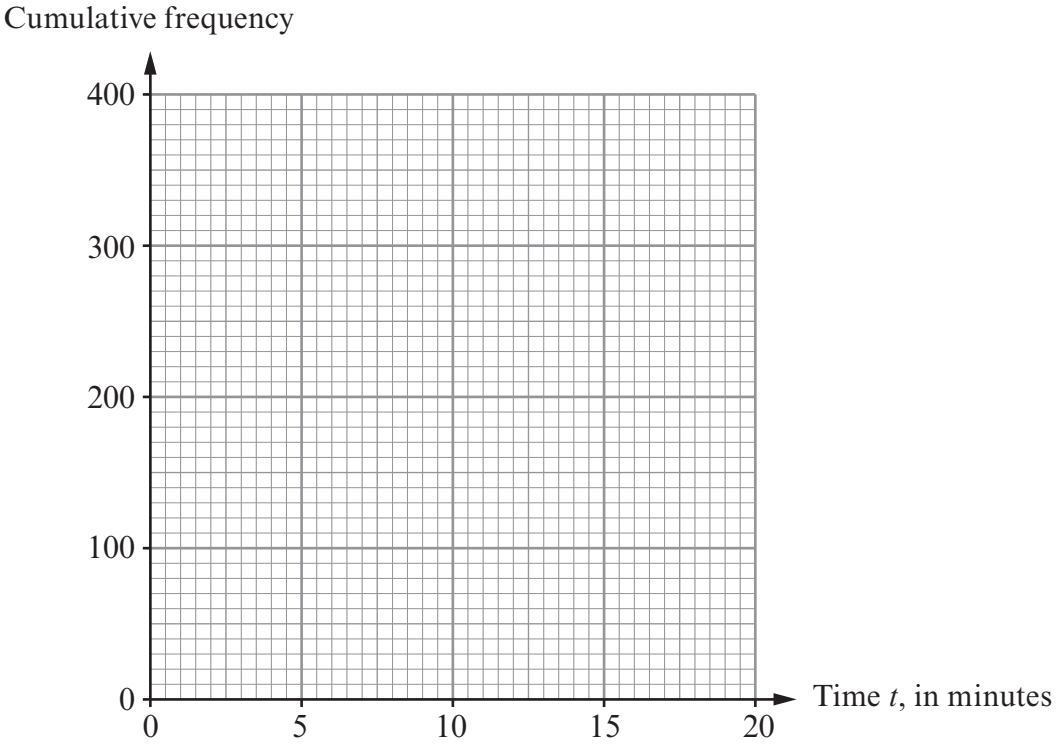
[2]

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(d) Use the graph paper below to draw a cumulative frequency diagram for the Cat Boots UK information.



[2]

(e) Use your cumulative frequency diagram to find

(i) an estimate for the median time of calls to Cat Boots UK,

.....

[1]

(ii) an estimate for the inter-quartile range of the times for calls to Cat Boots UK.

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.....

.....

[2]

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13. A farmer has just enough food to feed x pigs for y days.

(a) Write down an expression for the number of days the farmer could feed z pigs with the same amount of food.

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[2]

(b) Write down an assumption you have made in answering part *(a)*.

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[1]

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14. *(a)* Express $\frac{x}{x-3} - \frac{x}{x+6}$ as a single fraction in its simplest form.

[3]

(b) Simplify $\frac{49x^2 - 100}{14x + 20}$.

[4]

(c) Simplify $\frac{(2x-5)^8}{(2x-5)^6}$.

[1]

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15. *(a)* Express $0\cdot4\dot{3}\dot{5}$ as a fraction.

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[2]

(b) Express $100^{-\frac{1}{2}}$ as a fraction.

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[1]

(c) Given that $f = \sqrt{2}$, $g = \sqrt{5}$ and $h = \sqrt{10}$, find, in its simplest form,

(i) $\frac{fg}{h}$,

.....

.....

.....

[1]

(ii) $fg + h$,

.....

.....

[1]

(iii) fh.

.....

.....

[1]

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16. The points A and B lie on the circumference of a circle with centre O.
The straight lines PAQ and RBQ are tangents to the circle.

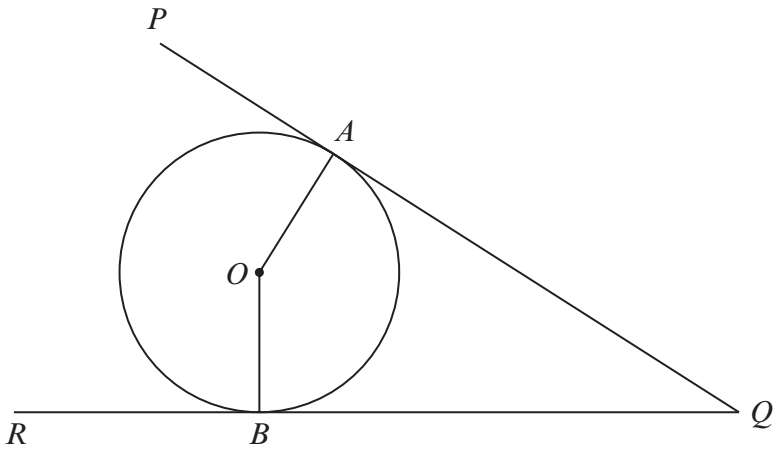


Diagram not drawn to scale

You are given that $A\hat{Q}B = 2x$, where x is measured in degrees.

Write down the size of $A\hat{O}Q$ in terms of x.
Give reasons in your answer.

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[4]

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17. *(a)* In an experiment, it was found that the velocity, v m/s, of a particle at time t seconds was given by the equation $v = 5t - t^2$.

Draw the graph of $v = 5t - t^2$ for values of t from 0 to 5.

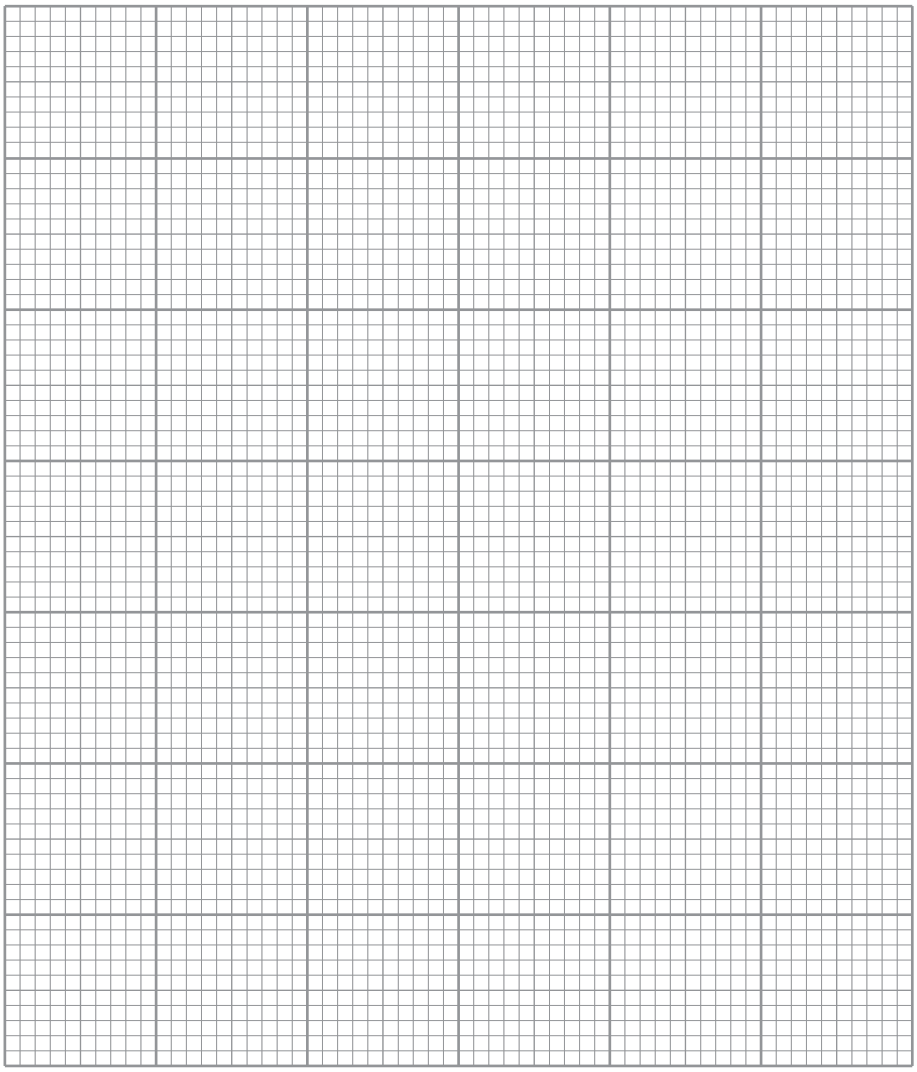
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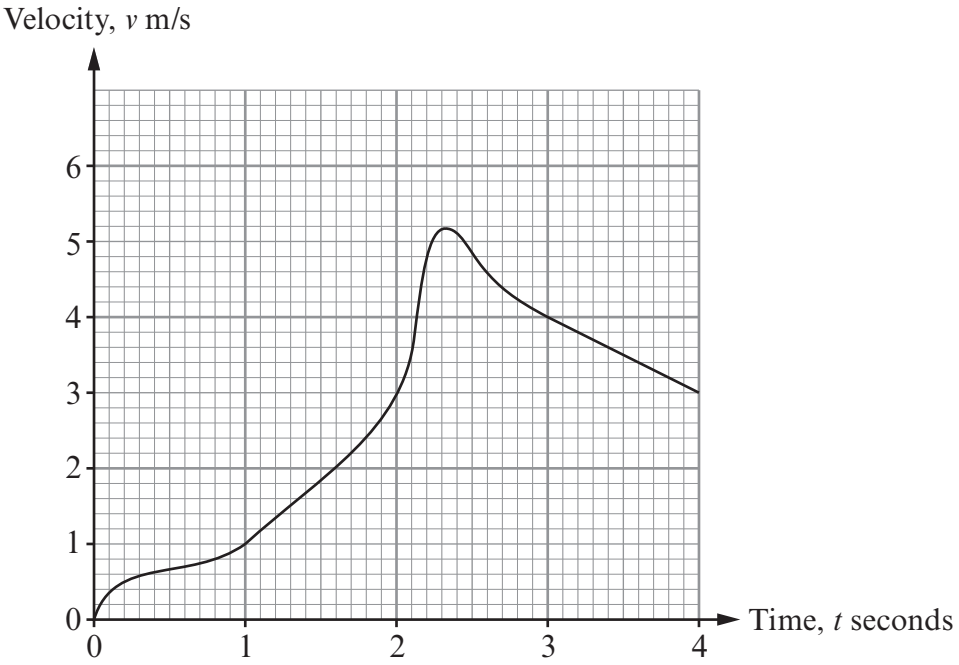
[4]

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(b) A velocity-time graph for a different experiment is shown below.



(i) Based on this experiment, complete the following sentence. [1]

"The acceleration of this particle is zero when t = ..."

(ii) Find an approximation for the acceleration of the particle in this experiment when $t = 1$. Give the units of your answer. [4]

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(iii) Find an approximation for the distance travelled by the particle between $t = 0$ and $t = 4$. [3]

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Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

SUMMER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE MATHEMATICS - LINEAR. 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
Paper 1 - Foundation Tier	1
Paper 1 - Higher Tier	5
Paper 2 - Foundation Tier	9
Paper 2 - Higher Tier	12

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Higher Tier Linear GCSE Mathematics Summer 2013 - Paper 1	Marks	FINAL MARK SCHEME Comments
1(a) a = 125° b = 55° c= 52°	B3	B1 for each, **FT b = 180 – a**, e.g. a=128 leads to b=52, which B0, B1.
2(a) All points plotted correctly	B2	B1 for at least 3 correct plots Ignore line of best fit
2(b) Positive	B1	Do not accept descriptions.
2(c) Line of best fit with points above and below	B1	Line of best fit must be appropriate for the trend of points Do not accept a line drawn corner-to-corner of graph paper
2(d) Their estimate, from their line of best fit	B1	FT for their incorrect line of best fit OR only if **no line** shown then accept answers in the range (£)430 to (£)460 inclusive
2(e) Evidence of takings / number of customers Approximately (**£**)5 (Accept £4.40 to £5.50)	M1 A1	Accept for any pair of values in proportion or any pair of values on the line of best fit, or using the gradient of the line of best fit. For the idea of proportion of takings/customers, which candidates may find from one set of values or summations Accept unsupported answers in the range
3(a)(i) (12/30)×100 40(%)	M1 A1	
3(a)(ii) 20(%)	B1	FT ½ (a)(i) provided it is a percentage
3(b) Fractions 15/30 (or ½) Fairtrade and 2/30 (or 1/15) non-Fairtrade	B2	B1 for either 15/30 (=1/2) OR 2/30 *Ignore any further working*
4 Accurate perpendicular bisector constructed with all necessary arcs Accurate bisection with evidence of all necessary arcs and the angle 45° (±2°) indicated	 B1 B2	*No marks if no arcs* Accept 1 pair of arcs with a correct mid point B1 for pair of arcs on appropriate lines with an attempt at the next step, but some inaccuracy, OR Accurate bisection with evidence of all necessary arcs but the angle 45° (±2°) NOT indicated

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Higher Tier Linear GCSE Mathematics Summer 2013 - Paper 1	Marks	FINAL MARK SCHEME Comments
5. (Manana Water cost for 700m^3 of water) 0.06×700 OR 6×700 42(€) 4200(cents) (Channel Water cost for 700m^3 of water) 30 + 0.02×700 = 44(€) (But, for Channel Water first bill cost is) 44×0.8 OR 44 – 0.2×44 (= 44 – 8.8(0)) 35.2(0 €) Choice, with any valid reason, e.g. 'Manana because after 1st 3 months change', 'Channel first 3 months (then change to Manana)', 'In the long run Manana', Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', € being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	 M1 A1 M1 A1 M1 A1 E1 QWC 2	*Award equivalent seen within looking at a fixed time period, e.g. 1 year, 2 years* Do not accept 4200€ Or equivalent. Must be consistent units for M1 FT 'their 44' provided previous M1 awarded or sight of 30 +(0.0)2×700 (or 1430) used in calculation or similar calculation with place value error *If M0, A0, due to working with only 1/3 of 44 reduced by 20%, then SC1 for an answer of 41.06(..) or 41.07* FT provided 1st two M1 marks awarded for each Water Company. Do not FT from 1430 or similar mixed unit error Accept answers based on a fixed time period, e.g. considering 3 years *Ignore any further incorrect calculation* 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 and grammar.
6(a) Correct enlargement Intention of correct position	B2 B1	B1 for any2 lines enlarged by scale factor 2
6(b) Correct rotation	B2	B1 for a near miss i.e. not on grid points, or for 90° clockwise rotation
7(a) 133(°)	B1	
7(b) 360 – 47 OR 133 + 180 313(°)	M1 A1	FT their '133' for M and A marks, however do not FT measured 110(±2) leading to 290 (M0,A0)
8 (a) Sight of 2×3×3×5 or 15 × 6 AND 3×5×7 or 15×7 HCF is 15	M1 A1	Or equivalent work with factors, other than 1, for both 90 and 105, e.g. 2×45 with 5×21 or equivalent showing exact divisions CAO

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Higher Tier Linear GCSE Mathematics Summer 2013 - Paper 1	Marks	FINAL MARK SCHEME Comments
8(b) $15 \times 2 \times 3 \times 7$ or $15 \times 6 \times 7$ LCM is 630	M1 A1	Or equivalent correct expression for LCM CAO
8(c) Method with at least 2 correct prime factors Sight of correct factors (2, 2, 2, 3, 3, 13) $2^3 \times 3^2 \times 13$ or $2^3 . 3^2 . 13$	M1 A1 B1	2 correct primes before 2nd error Ignore 1s seen FT their factors (with at least one index >1 used). Do not ignore 1s.
9. Circumference or width $2 \times \pi \times 10$ or $\pi \times 20$ 62.8(…cm) Area rectangle 62.8×200 OR 0.628×2 $12560\ cm^2$ OR $1.256\ m^2$	M1 A1 M2 A1	Or equivalent in metres Or equivalent in metres FT only if 'their 62.8' is clearly a circumference, i.e. from '$\pi \times$value', do not FT for 'area×2(00)' etc. M1 for appropriate calculation but units inconsistent and not corrected later CAO Units must be given *Allow ISW once correct answer seen*
10.(a) $y^2 = g + t$ $y = (\pm)\sqrt{(g+t)}$	B1 B1	 FT from $y^2 = g - t$ to $y = (\pm)\sqrt{(g-t)}$
10(b) $3y + w = 10y + 15$ $3y - 10y = 15 - w$ OR $w - 15 = 10y - 3y$ $-7y = 15 - w$ OR $w - 15 = 7y$ $y = \frac{15 - w}{-7}$ OR $y = \frac{w - 15}{7}$	B1 B1 B1 B1	Includes correct expansion FT until 2nd error FT if total of y terms has not been simplified. Mark final answer
11. $6l + 8w = 55$ and $4l + 12w = 50$, OR alternative full strategy Method to equate coefficients (allow 1 slip) First variable Method to find second variable Second variable	S1 M1 A1 m1 A1	Accept other informal notation FT for their logical simultaneous equations, including semi-perimeter ($3l + 4w = 55$ and $2l + 6w = 50$), or equivalent inconsistent type of error, for M1, FT from M1 to A1 provided answer positive FT provided 1st M1 FT from m1 to A1 provided answer positive Width = 2(cm) Length = 6.5(cm) *Alternative:* *S1 Trial & improvement method working with all criteria* *M1 Two different trials attempting to match criteria* *M1 Two trials, one either side of desired (This may imply previous M1also)* *A1 Width 2(cm)* *A1 Length 6.5(cm)* *If final answers of 2(cm) and 6.5(cm), award S1 and B4*
12(a) 275	B1	
12(b) Selecting Cat Boots UK with a reason, e.g. 'right skew', 'more calls longer than 10 minutes'	E1	
12(c) 25, 125, 300, 360	B2	B1 for any two correct values, OR FT cumulative from 1 error finding 2 further cumulative values accurately
12(d) 3 unique vertical plots correct at upper bounds All plots correct and joined, **including** to zero at t=0	M1 A1	Now only FT their cumulative table to (d) *Ignore bars only if intention clear that line or curve is being used in (e)*
12(e) (i) Median from cumulative graph (180th)	B1	FT from their cumulative graph of joined points (Actual is approximately 11.5)
12(e)(ii) Attempt, (using the reading on the horizontal from 270 and 90) UQ – LQ IQR	M1 A1	FT for their cumulative graph of joined points (Actual is approximately 14 or 14.5 – 8 or 8.5) (5.5 to 6.5)

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Higher Tier Linear GCSE Mathematics Summer 2013 - Paper 1	Marks	FINAL MARK SCHEME Comments
13(a) xy/z OR x×y÷z	B2	B1 for sight of xy, x/z or y/z, this may be within an incorrect expression involving multiplication and division only, e.g. 'xyz', 'y/xz'
13(b) E.g. 'all pigs eat the same', 'same amount given to pigs each day'	E1	Must include idea of 'same' or 'equality'
14(a) x(x+6) – x(x-3) as a numerator (x-3)(x+6) as a denominator 9x / (x-3)(x+6)	M1 M1 A1	Accept intention of brackets when working not shown, e.g. $x^2 + 6x – x^2 – 3x$, or 3x CAO. If (x-3)(x+6) expanded, must be correct If M1, M1, A1 awarded penalise further incorrect work -1. If no marks then SC1 for 9x
14(b) (7x + 10)(7x -10) 2(7x +10) (7x – 10)/2	B2 B1 B1	B1 for (7x … 10)(7x … 10) FT provided no more than 1 previous error and provided simplification required. Mark final answer. Accept 3.5x - 5
14(c) $(2x – 5)^2$ (ISW) OR $4x^2 – 20x + 25$ (ISW)	B1	Do not accept $4x^2 – 10x – 10x + 25$
15(a) 10x = 4.3535... **and** 1000x = 435.3535... with an attempt to subtract 431/990 ISW	M1 A1	Or x = 0.43535… **and** 100x = 43.535… with an attempt to subtract, or equivalent. Or alternative method An answer of 43.1/99 gains M1 only
15(b) 1/10	B1	Do not accept 0.1
15(c)(i) 1	B1	CAO
15(c)(ii) $2\sqrt{10}$	B1	CAO
15(c)(iii) $2\sqrt{5}$	B1	CAO
16. OBQ or OAQ = 90(°) Reason: radius meets tangent Angles of quadrilateral total 360(°), OR angles of a triangle 180(°) with equal tangents 90 – x or unsimplified equivalent	B1 E1 E1 B1	Accept shown on the diagram, accept indication of right angle symbolically Accept mention of symmetry or isosceles triangles or indication of equal sides on the diagram
17.(a) Correct evaluation of at least 3 coordinates Suitable axes with appropriate scale and labels Plotting at least 4 correct points All 6 points correct and joined with a curve	B1 B1 M1 A1	t: 0 1 2 3 4 5 v: 0 4 6 6 4 0 FT for their axes if reasonable. FT their coordinates provided at least B1 previously awarded CAO. Not a FT from incorrect coordinates
17(b)(i) 2.3 to 2.35	B1	
17(b)(ii) Draw a tangent at t = 1 Use of or stating difference v / difference t Gradient from working with tangent and differences m/s^2	M1 m1 A1 U1	 Must be differences, not readings from axes Accept unsimplified fraction but not if it contains a decimal Independent of M and A marks
17(b)(iii) Splitting area under curve into areas that can be approximated At least two correct areas within a sum to calculate the total area Estimate for area from correct calculation of suitable areas	M1 M1 A1	Maybe shown on the graph (e.g. equal ordinates width 1 is 0.5+2+3.5+3.5) (= 9.5)

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Surname	Centre Number	Candidate Number
Other Names		0

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GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. TUESDAY, 6 November 2012

2 hours

CALCULATORS ARE NOT TO BE USED 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.

INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5***(a)*.

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

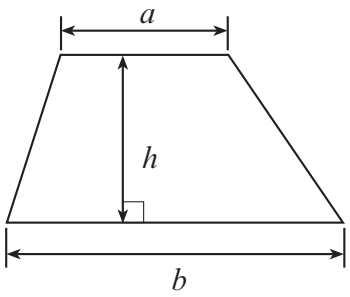
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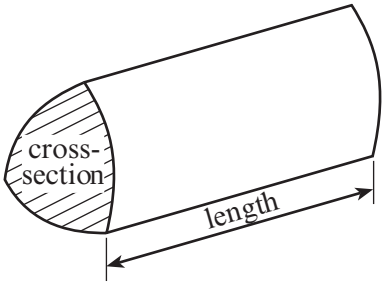
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Formula List

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

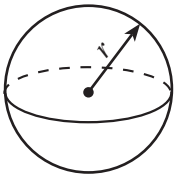


Volume of prism = area of cross-section × length



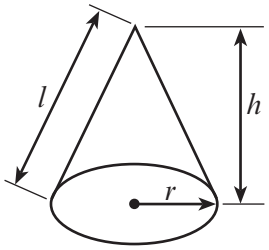
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

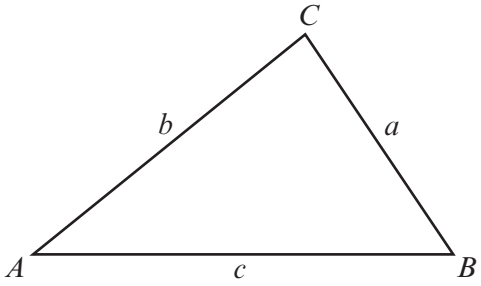


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

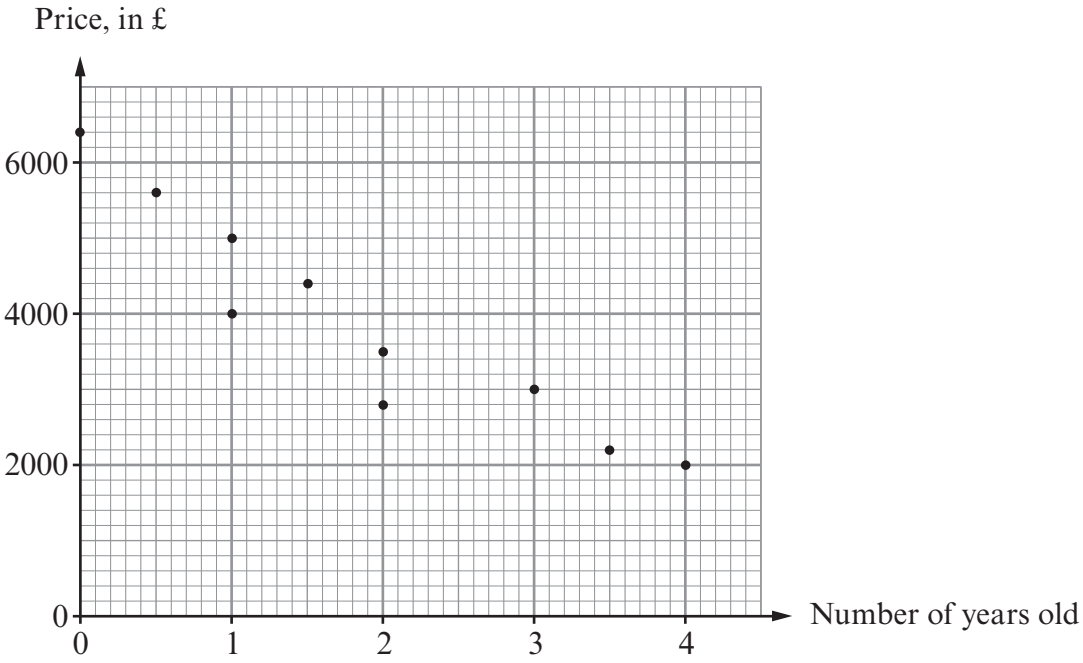
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. The scatter diagram shows the price and age for each of 10 cars of the same make and model.



(a) Write down the price of the new car.

.....

[1]

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

.....

[1]

(c) Draw, by eye, a line of best fit on the scatter diagram.

[1]

(d) Write down the type of correlation shown by the scatter diagram.

.....

[1]

(e) Estimate the price of a $2\frac{1}{2}$ year old car of the same make and model.

.....

[1]

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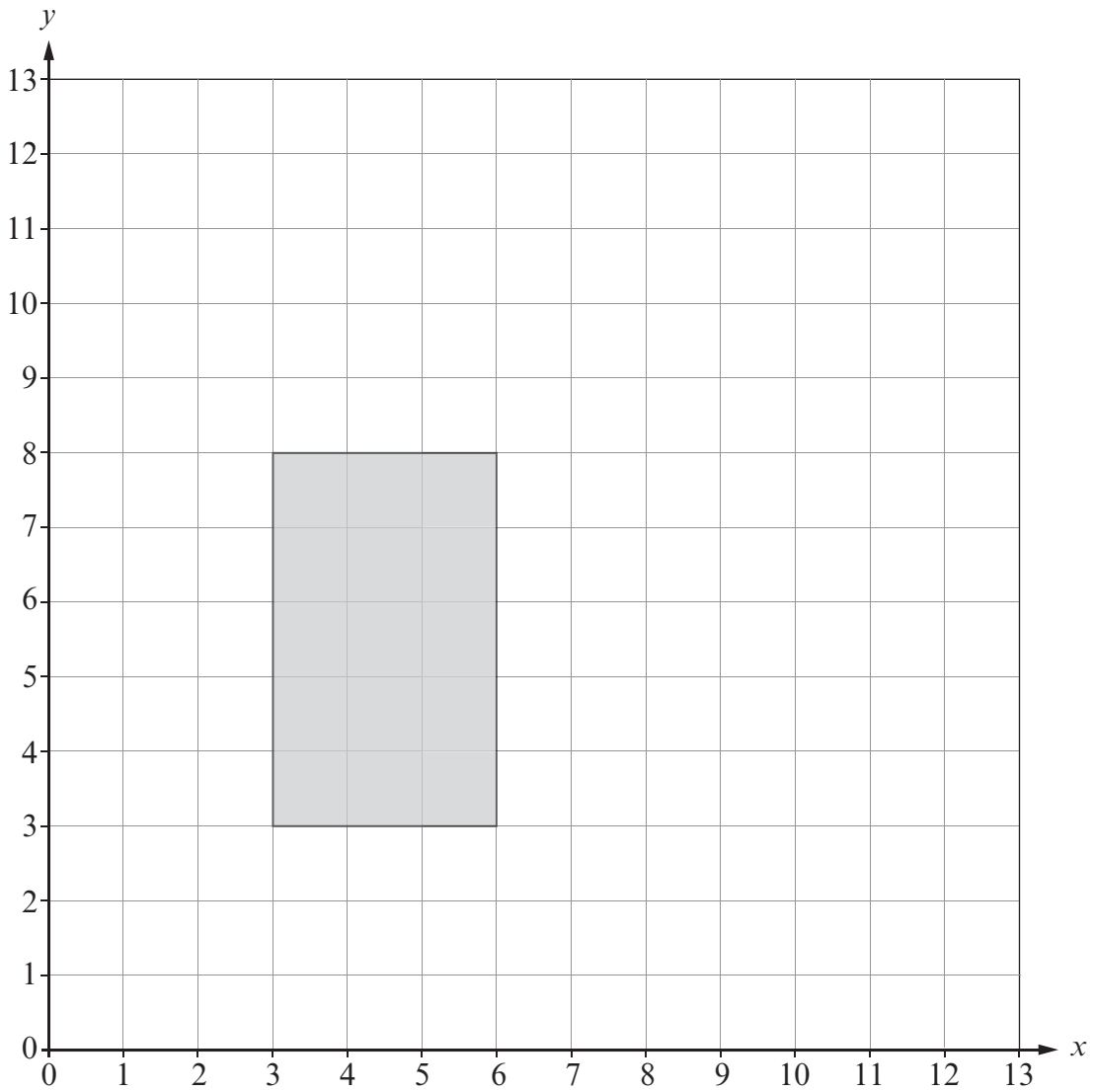
Turn over.

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2. *(a)* Translate the rectangle shown 6 units to the right and 3 units up.

[1]



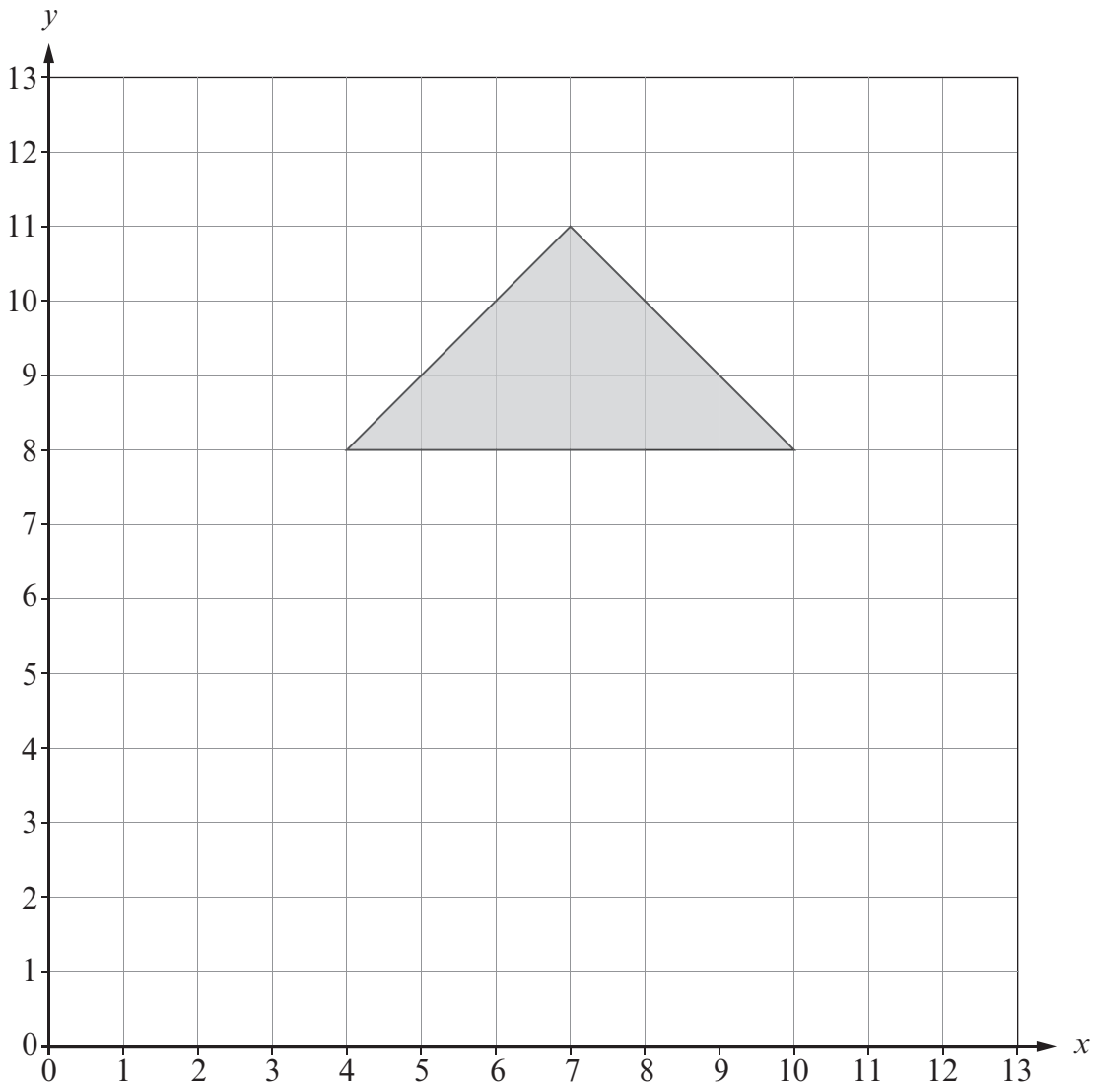
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(b) Draw a reflection of the triangle in the line $y = 6$.

[2]



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3. One day, Aled travels on his bike to the gym.
Below is a description of his journey.

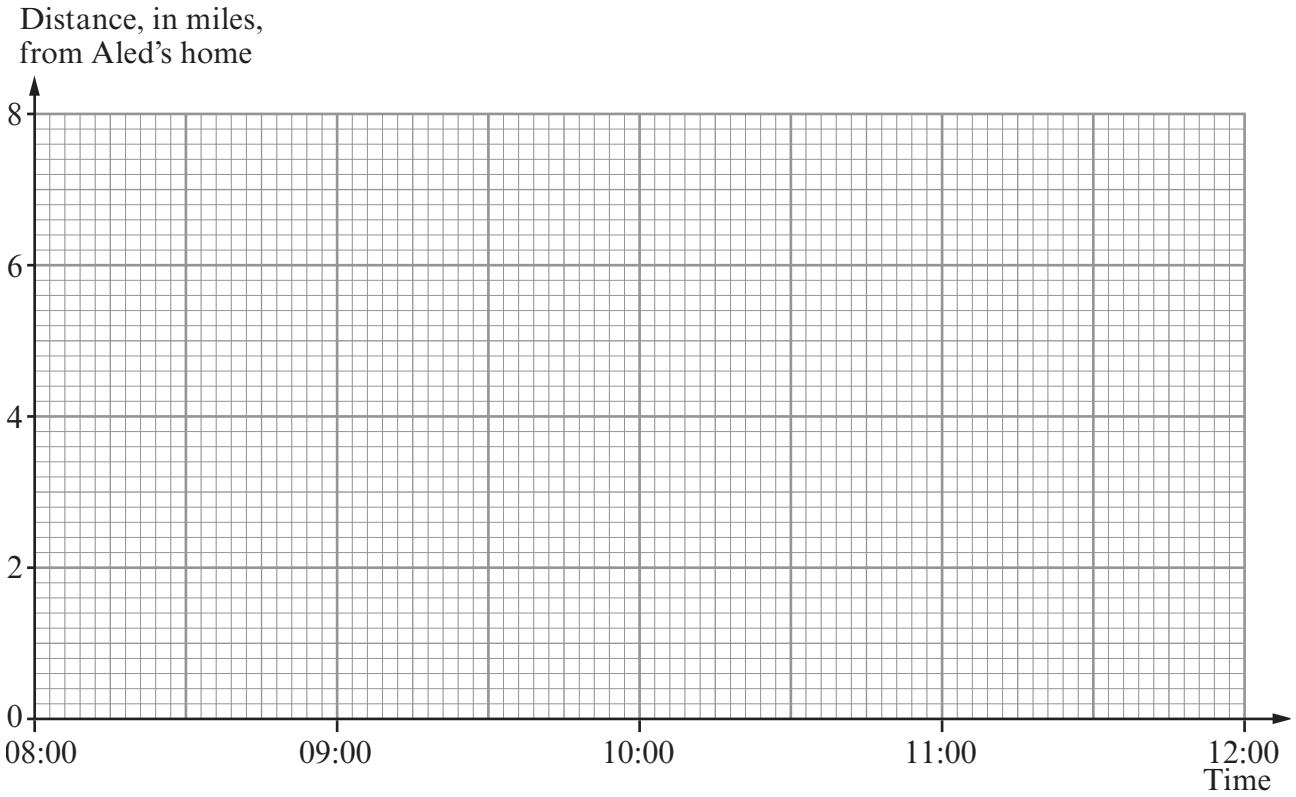
08:00	Leaves home
08:15	Stops at a friend's house on the way to the gym
08:36	Leaves his friend's house
09:00	Arrives at the gym
11:00	Leaves the gym
11:30	Arrives home

Aled's friend lives on his route to the gym.

Aled lives $2\frac{1}{2}$ miles away from his friend.

It is a further 3 miles from Aled's friend's house to the gym.

(a) Use the information about Aled's journey to draw a travel graph on the graph paper below.



[4]

(b) Calculate Aled's average speed, in mph, for his journey home.

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.....

[2]

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4. *(a)* Solve $6x - 7 = 2x + 21$.

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[3]

(b) Factorise $24x + 3$.

.....

[1]

(c) Factorise $x^2 - 6x$.

.....

[1]

(d) Expand $2x(x^3 + 6)$.

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.....

[2]

(e) Solve $\frac{x}{3} + 15 = 25$.

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[2]

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5. A community hall has a large number of rectangular tables and a large number of chairs.
The tables can seat up to 3 people along each of the longer sides and 1 person at each end.

A street party is being organised using the community hall's tables and chairs.
Tables are joined and placed in a long straight line.
Tables meet edge to edge to form the line.

(a) *You will be assessed on the quality of your written communication in this part of the question.*
What is the least number of tables needed to seat 164 people?
You must show all your working and explain how you arrive at your answer.

[6]

(b) There are n people sitting around a straight line of tables.
There are no empty seats.
Write an expression in terms of n for the least number of tables needed to seat these people.

[3]

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6. Roz and Simon each throw a fair dice.
Calculate the probability that the sum of the two numbers obtained is 4.

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[3]

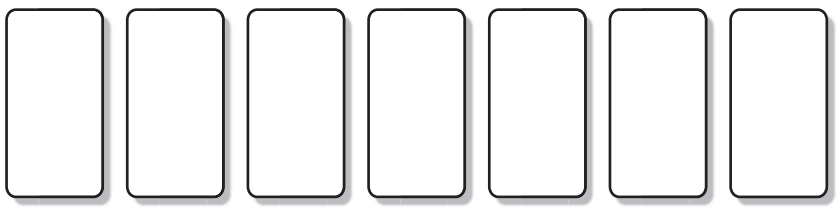
7. Seven **single digit numbers** have a median of 6 and a range of 8.
The mode of the seven numbers is 3.
Find the seven numbers.
Write your single digit numbers in order in the boxes.

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[4]

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8. *(a)* Estimate the value of $\frac{48 \times 21}{199}$.

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[2]

(b) Given that $46 \times 345 = 15\,870$, find the value of $\frac{1587}{460}$.

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[1]

(c) Write down the value of a half of $\frac{3}{8}$. Give your answer as a fraction.

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[1]

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(d) Express 240 as a product of prime factors using index notation.

[3]

(e) Evaluate the reciprocal of 0·9 and state whether this is greater or less than 0·9.

[2]

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9. *(a)* Expand and simplify $(2x + 5)(3x - 4)$.

[3]

(b) Factorise $2x^2 + x - 3$ and hence solve $2x^2 + x - 3 = 0$.

[3]

(c) Simplify $\dfrac{(x+5)^8}{(x+5)^2}$.

[1]

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(d) Write down the *n*th term of the sequence 5, 8, 13, 20, 29, ...

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[2]

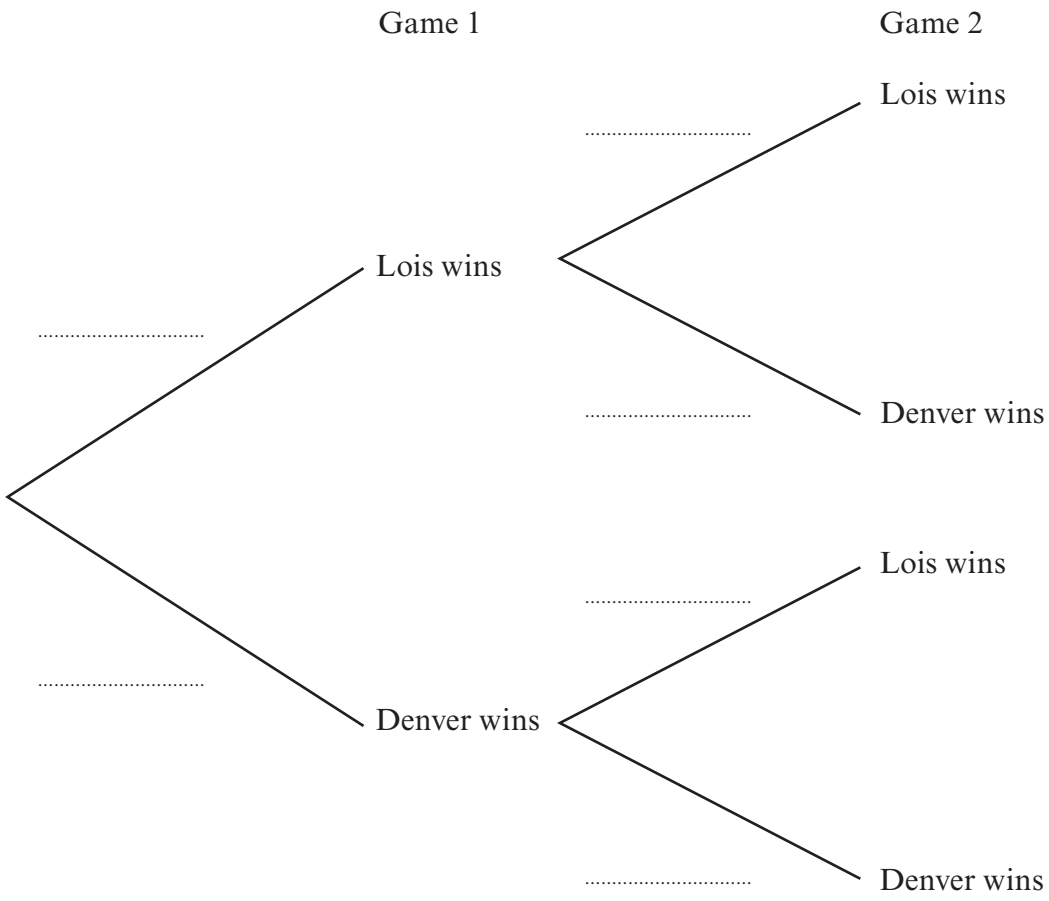
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10. Whenever Lois and Denver play a game of Bubble on their computer, the probability that Lois wins is 0·3. No game of Bubble ever ends in a draw.

(a) Complete the following tree diagram to show the probabilities of what can happen when Lois and Denver play two games of Bubble.



[2]

(b) Calculate the probability that Denver wins both games of Bubble.

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[2]

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11. A rectangular lawn has a length of 9 m and a width of 5 m.
A builder is asked to make a path of width x metres around the outside edge of the rectangular lawn.

(a) All the edges of the path are straight.
Find an expression for the area of the path in terms of x.
Give your answer in its simplest form.

[4]

(b) At the corners of the lawn it is possible to curve the outer edge of the path and still keep the width of the path equal to x metres.
Find an expression for the area of this path in terms of x and π.
Give your answer in its simplest form.

[3]

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12. The table shows values of $y = -x^2 + 8x - 12$ for values of x from 1 to 8.

x	1	2	3	4	5	6	7	8
$y = -x^2 + 8x - 12$	-5	0	3	4	3	0		

(a) Complete the table above.

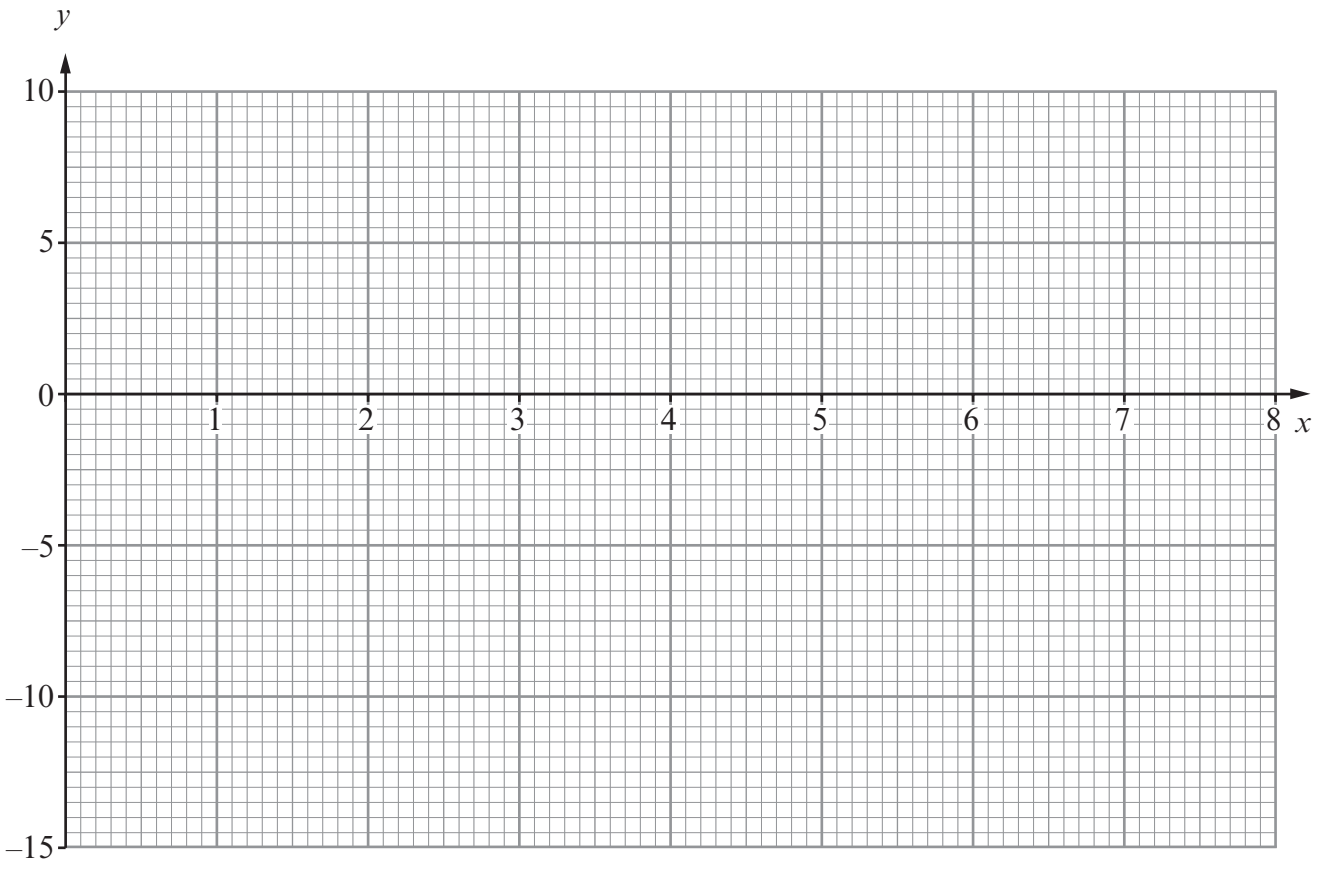
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[2]

(b) On the graph paper below, draw the graph of $y = -x^2 + 8x - 12$ for the values of x from 1 to 8.

[2]



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(c) Use your graph to write down the solutions of the equation $-x^2 + 8x - 12 = 0$.

.....

[1]

(d) Use the trapezium rule, with the ordinates $x = 2$, $x = 3$, $x = 4$, $x = 5$ and $x = 6$, to estimate the area of the region enclosed by the curve and the x-axis.

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[4]

13. Given that y is inversely proportional to x^2, and that $y = 10$ when $x = 12$, find an expression for y in terms of x.

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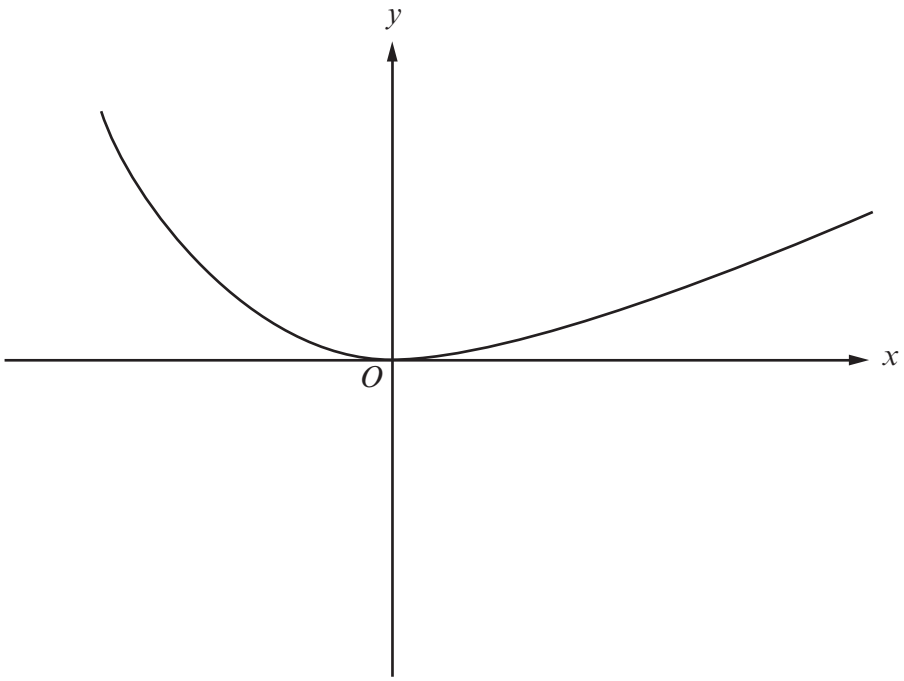
[3]

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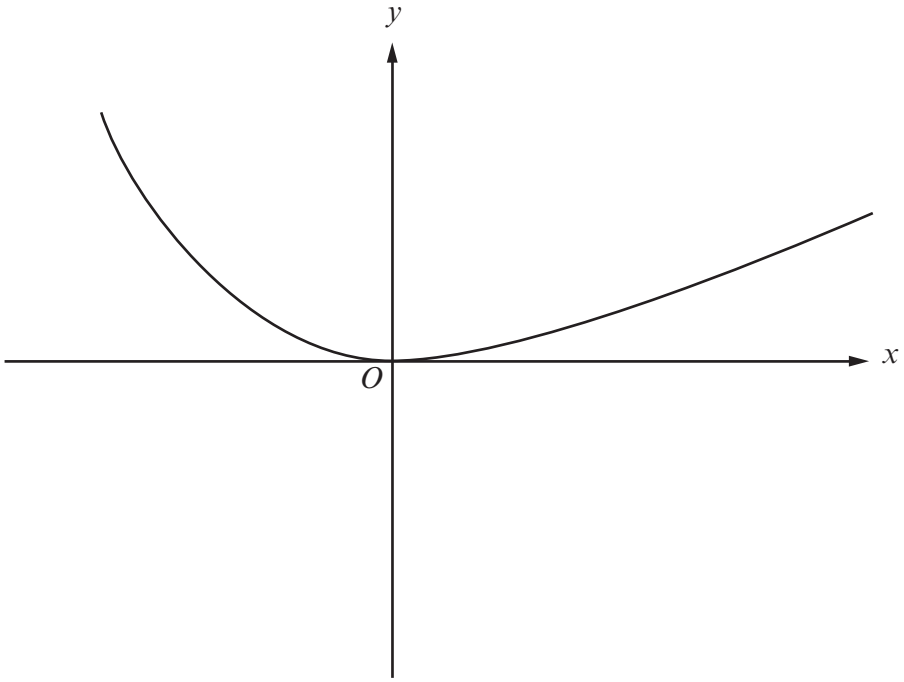
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14. *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x - 2)$.
Mark clearly the coordinates of the point where this curve touches an axis.



[2]

(b) The diagram shows another sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x) + 3$.
Mark clearly the coordinates of the point where this curve meets the y-axis.



[3]

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15. *(a)* Express $400^{-\frac{3}{2}}$ as a fraction.

[2]

(b) Express $0{\cdot}6\dot{5}\dot{2}$ as a fraction.

[2]

(c) Simplify $\left(3 - 5\sqrt{2}\right)^2$ and state whether your answer is rational or irrational.

[3]

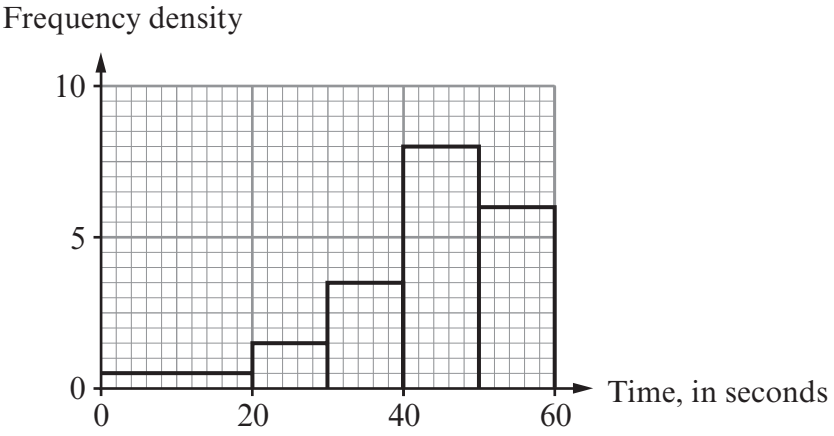
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16. *(a)* The time taken to sew a button on a shirt was measured for each child in a group of 200 children.
The histogram below illustrates the results obtained.



Use the histogram to calculate how many of the children took less than 50 seconds to sew a button on a shirt.

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.....

[3]

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(b) The time taken to sew a button on a shirt was measured for each adult in a group of 200 adults.
The following grouped frequency distribution was obtained.

Time, t seconds	$0 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$
Number of adults	20	20	25	35	100

(i) Find an estimate of the median of this distribution.

.....

[1]

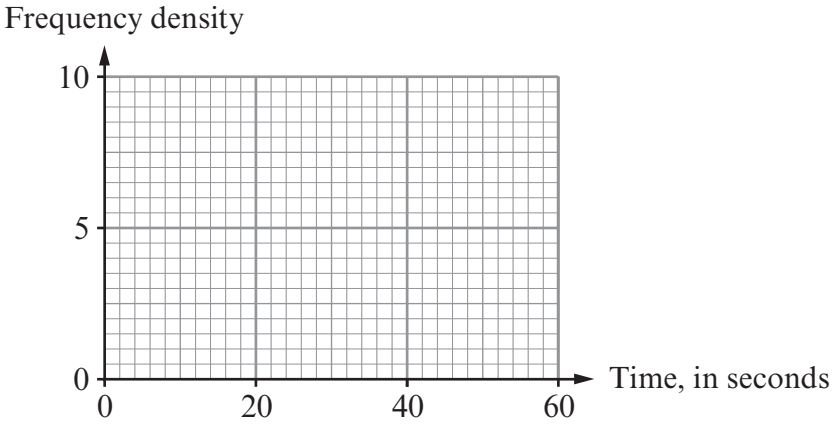
(ii) Draw the histogram to illustrate the distribution on the graph paper below.

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[3]



(c) Using the information from parts *(a)* and *(b)*, do you think the adults are faster than the children at sewing buttons on shirts? You must give a reason for your answer.

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[1]

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

NOVEMBER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2012 examination in GCSE MATHEMATICS - LINEAR. 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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PAPER 1 - HIGHER TIER

PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
1.(a) (£)6400	B1	
(b) (£)2000	B1	
(c) Reasonable straight line of best fit	B1	Some points above and some points below. Do not accept from 'corner' to 'corner' of the graph paper
(d) Negative (correlation)	B1	
(e) FT from a 'line of best fit' (reading accurate to small square) (curved line or straight line, not dot-to-dot)	B1 5	OR an answer between (£)2600 and (£)3600 inclusive if no line of best fit.
2.(a) Correct translation	B1	
(b) Correct reflection	B2 3	B1 for sight of y = 6 or reflection in any horizontal
3.(a)		Mark intention of straight lines throughout the question *Use the acetate to follow **through** for each time period, i.e. 8:15, 9:00,11:00* Penalise not joined with lines -1 only
(08:00, 0) to (08:15, 2.5) joined with a line	B1	
(08:15, 2.5) to (08:36, 2.5) joined with a line AND (08:36, 2.5) to (09:00, 5.5) joined with a line	B1	
(09:00, 5.5) to (11:00, 5.5) joined with a line	B1	
(11:00,5.5) to (11:30, 0) joined with a line	B1	SC2 for an 'correctly shaped but inverted travel graph', or SC1 if '1 error' in this inverted travel graph
(b) 5.5 / 30 (minutes) or 5.5 / ½ (hour) or 5.5 + 5.5 11/60(miles/min)	M1	Accept 5 ½ for the distance FT their total distance from their graph in (a), but time must be 30 minutes or ½ hour, do not accept 0.30 as 30 minutes
11 (mph)	A1 6	
4.(a) 6x – 2x = 21 + 7	B1	FT until 2nd error
4x = 28	B1	OR x = 28/4
x = 7	B1	Must be simplified
(b) 3(8x +1)	B1	CAO
(c) x(x – 6)	B1	CAO
(d) $2x^4 + 12x$	B2	B1 for each term. If B2 penalise further incorrect work -1
(e) x/3 = 25 – 15	M1	Or alternate correct first step
x = 30	A1	CAO. Accept embedded answers. Mark final answer. SC1 for x=120 from x/3 = 40, OR
	9	SC1 for 'ladder method' showing -15, ×3

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
5.(a) Strategy, shorter edges meeting (accept a diagram) (Showing) 6 on longer sides (2 lots of 3) and 1 on each end OR idea end tables seat 7 people and middle table seat 6 people (Number of tables is) $(164 - 2) \div 6$ OR 2 correct trials with equivalent "$\times 6 + 2$" 27 (tables) QWC0 for answer only QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, maybe with diagrams and words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer (b) $(n - 2) \div 6$ OR $(n - 2)/6$ OR equivalent	S1 M1 M1 A1 QWC 2 B3 9	May be implied in later working that this is the arrangement Accept intention, not about notation. For a complete correct method that could lead to 27 tables SC2 for 79 or 54, or SC1 for $(164 - 6)/2$ *Alternative:* *Any 3 multiples of 6 shown or3 terms of a sequence going up in 6s, or 164/6 or 164÷6* *S1* *$27 \times 6 = 162$ OR 27 remainder 2 OR 27.3(3..)* *M1* *(this implies S1 also)* *162 + 2 = 164 (seen or implied)* *M1* *27 (tables)* *A1* *An answer of 27 from working '27 remainder 2' or '27.3(3..)' must be confirmed in order to award the final M1, A1 (i.e. remainder justified), otherwise SC1 instead* *An answer of 27 (tables) without working is awarded SC3* QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. *FT misunderstanding longer edges joined leading to (n-6)÷2* B2 for $n-2 \div 6$ or $n - 2/6$ or $-2 \div 6$ B1 for -2 or $\div 6$ in an expression or $n = 6 \times$tables $+ 2$, or $n = 6 \times t + 2$ B0 for $\times 6 + 2$ or $n \times 6 + 2$
6. Realising could be 2+2, 1+3, 3+1 Realising 36 different outcomes OR sight of $1/6 \times 1/6$ OR product of 2 terms both with denominators of 6 seen OR sight of a denominator of 36 3/36 or equivalent	B1 B1 B1 3	May be within a sample space diagram, e.g. sight of two-way table with three 4s shown, or the appropriate additions Maybe shown in a sample space diagram with indication of 36, must be stated not implied Ignore incorrect cancelling

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
7. Middle card 6 Two cards (or more) 3 as the mode for their cards First card 1 and last card 9 (or in reverse) Correct answer 1 3 3 6 7 8 9 or in reverse	 B1 B1 B1 B1 4	<u>If boxes are blank, mark the working</u> Smaller numbers to one side and larger to the other 3 is the distinct mode for their cards OR any pair of single digit numbers (including negatives) with a difference of 8 CAO
8.(a) 3 reasonable rounded values which could lead to simple calculations Correct evaluation for their figures (b) 3.45 (c) 3/16 (d) 2, 2, 2, 2, 3, 5 $2^4 \times 3 \times 5$ (e) 1/0.9 or 1/ (9/10) or 10/9 10/9 and indication that this is GREATER than 0.9	M1 A1 B1 B1 B2 B1 M1 A1 9	Not all 3 need to be different to those given (*Common responses include 5 here)* CAO Allow 0.1875. Do not accept 1.5/8 B1 for at least 2 correct primes before 2nd error FT "their" primes, needs to have at least 1 index>1 Or $1^1/_9$ or 1.1(11..), statement in reverse
9.(a) $6x^2 + 15x – 8x - 20$ $= 6x^2 + 7x – 20$ (b) $(2x +3)(x – 1)$ Both possible solutions $x = -3/2$ AND $x = 1$ (c) $(x + 5)^6$ (d) $n^2 + 4$ or equivalent	B2 B1 B2 B1 B1 B2 9	B1 for any 3 terms correct FT from B1 provided collection required. Mark final answer SC1 for an answer of $6x^2$ (…) – 20 B1 for (2x .. 3)(x .. 1) or (2x .. 1)(x .. 3) FT from their pair of brackets CAO. Mark final answer B1 for (1)$n^2 \pm$ …, not for n^2 alone
10.(a) All entries correct (b) 0.7×0.7 0.49	B2 M1 A1 4	B1 for any one pair of branches correct FT from their tree, provided numbers >0 and <1
11.(a) Initial strategy, e.g. sketch of concentric rectangles Correct method to find area, e.g. subtraction of areas or composite shapes $(9+2x)(5+2x) - 9\times5$ or $9x+9x+5x+5x+x^2+x^2+x^2+x^2$ $4x^2+28x$ or $4(x^2 + 7x)$ or $4x(x +7)$ (b) Strategy, drawing with ¼ circles in corners OR sight of πx^2 of a fraction or multiple of πx^2 (or equivalent) $9x+9x+5x+5x+ 4\times 1/4 \times \Pi \times x^2$ $28x + \Pi x^2$ or $x(28 + \Pi x)$	S1 M1 A1 A1 S1 M1 A1 7	 For intention, but some sections may be missed Or equivalent Mark final answer *If the path has been built inside then MR-1 and FT (leading to $28x – 4x^2$)* FT from (a), to give their (a) – $4x^2 + \Pi x^2$, Not for sight of πr^2 Mark final answer *If the path has been built inside then MR-1 and FT*
12.(a) -5 and -12 (b) Any 6 correct plots All 8 correct plots joined with a smooth curve (c) 2 and 6 (d) y values 0, 3, 4, 3, 0 Split correct region into areas to sum Numerically correct area calculations shown 10 (square units)	B2 B1 B1 B1 B1 M1 A1 A1 9	B1 for each correct answer FT from (a) FT from (a) Coordinate notation is not required. Accept embedded answers Sight of these values alone or within a calculation FT for 1 incorrect y value only. May included area below x-axis (½ (3) + ½ (3+4) + ½ (4+3) + ½ (3)) (+ 60 if below x-axis included CAO
13. $y \alpha 1/x^2$ OR $y = k/x^2$ $10 = k/12^2$ $y = 1440/x^2$	B1 M1 A1 3	Ignore use of incorrect symbol 'α' later FT $y \alpha 1/x$ or $y \alpha x^2$ for possible M1, A1

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PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
14.(a) Transformation horizontally to the right Correct translation with 2 indicated correctly on the x-axis (b) Idea of reflection in x-axis Idea of vertical translation Correct transformation with 3 indicated on the y-axis	B1 B1 B1 B1 B1 5	 SC1 for left shift with -2 indicated on the x-axis May include an incorrect translation, but clearly there has been a reflection Allow 'up' or 'down'
15.(a) 1/8000 (b) Attempt to subtract $100x = 65.252\ldots$ and $x = 0.652\ldots$ 646/990 ISW (c) $9 - 15\sqrt{2} - 15\sqrt{2} + 50$ $= 59 - 30\sqrt{2}$ Irrational	B2 M1 A1 M1 A1 B1 7	B1 for $1/20^3$ Or equivalent for $1000x - 10x$ Final answer of 64.6/99 M1 only With at least 3 of the terms correct OR $9 \pm a\sqrt{2} + 50$ with $a \neq 0$ CAO FT provided at least M1 awarded
16.(a) Any one correct area $10 + 15 + 35 + 80$ $= 140$ (b) (i) 50 (seconds) (ii) Correct histogram (c) A reasonable statement, e.g. 'No, children median lower', or 'no, 140 children less than 50 seconds but only 100 adults', or 'no, because more adults spent over 50 seconds'	B1 M1 A1 B1 B3 E1 8	10, 15, 35, 80, 60 If no other marks allow SC1 for an answer of 135 Do not accept a group or interval B2 for sight of 1, 2, 2.5, 3.5, 10 or histogram with first bar correct but with 1 error in one of the other bars, OR B1 for histogram with any 3 bars correct Could be either Yes or No with a suitable reason. FT their histogram Accept an answer of 'same' if the candidate calculating the means to be the same

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

P.M. MONDAY, 11 June 2012

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14.

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)*.

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

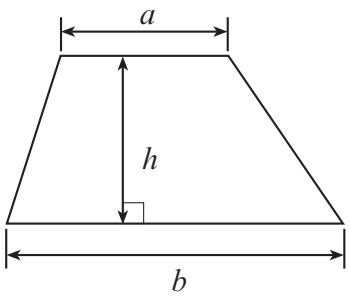
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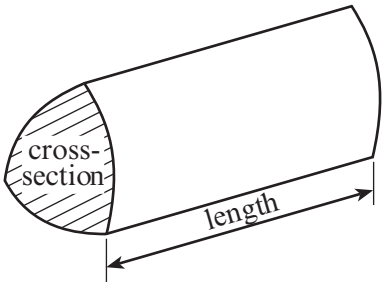
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Formula List

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

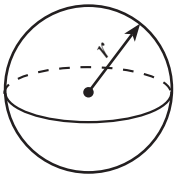


Volume of prism = area of cross-section × length



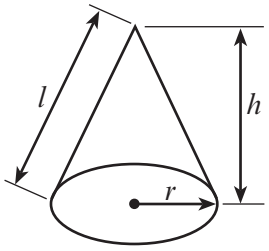
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

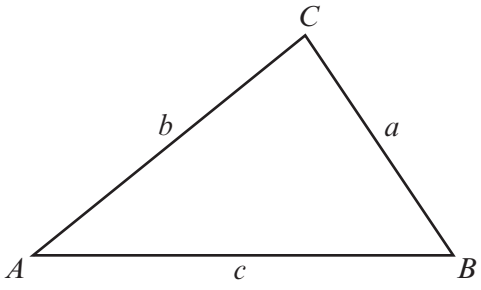


In any triangle ABC

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

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

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



The Quadratic Equation

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

where $a \neq 0$ are given by

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

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1.

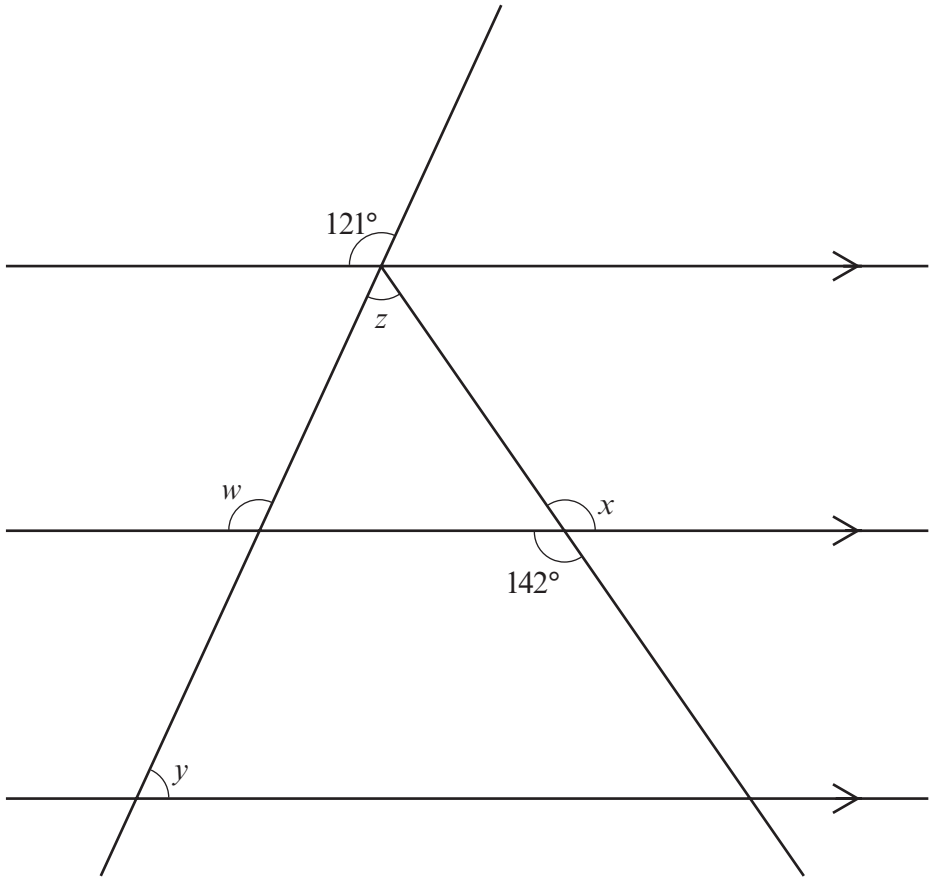


Diagram not drawn to scale

Find the size of each of the angles *w, x, y* and *z*.

.....

.....

.....

.....

w = ... °

x = ... °

y = ... °

z = ... °

[4]

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

Enzo is given clues to help him solve a problem.

Clues:

- The shape is a polygon
- The shape has an odd number of sides
- The shape is not a triangle
- The shape has fewer than 7 sides
- Three of the interior angles each measure 106°
- All the other angles are marked with the letter x

Solve Enzo's problem to find the size of x.

[8]

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(b)

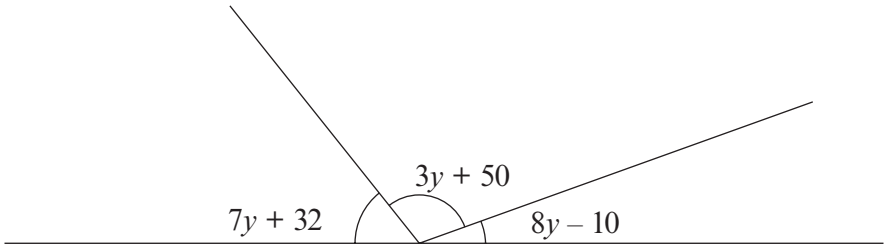


Diagram not drawn to scale

All of the angles are measured in degrees.

Find the size of each of the three angles.

.....

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$7y + 32 =$ ..... ° $3y + 50 =$ ..... ° $8y – 10 =$ ..... °

[5]

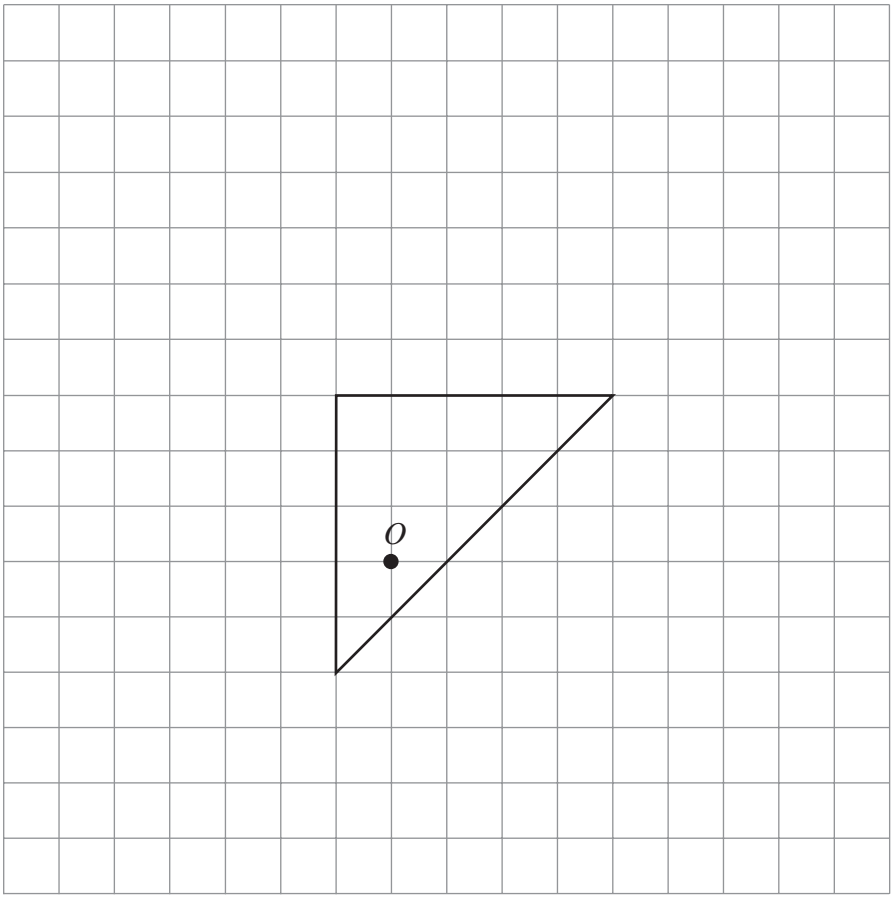
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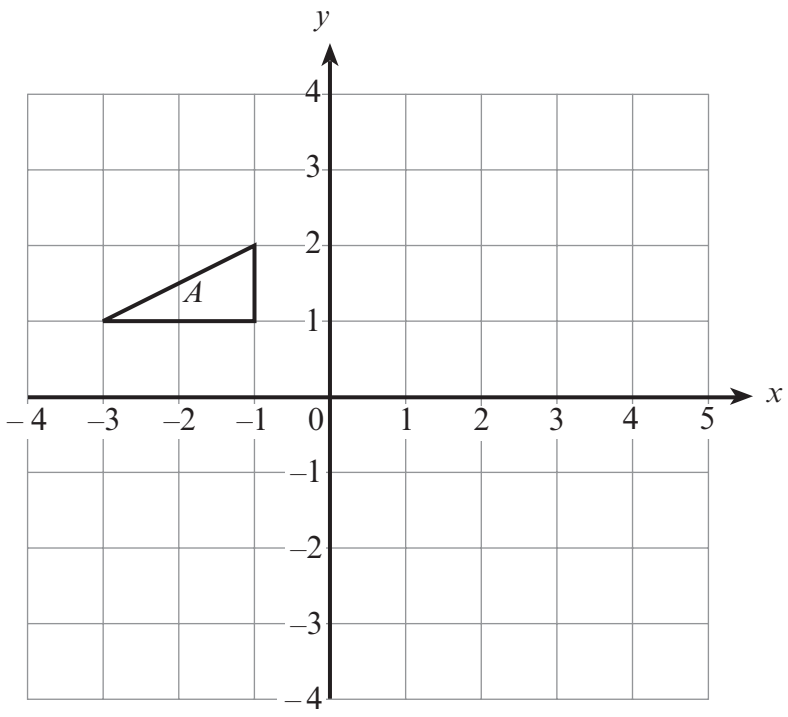
3. *(a)* On the grid below, draw an enlargement of the triangle using a scale factor of 2 and centre *O*.

[3]



(b) Rotate the triangle *A* through 90° clockwise about the origin.

[2]



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(c)

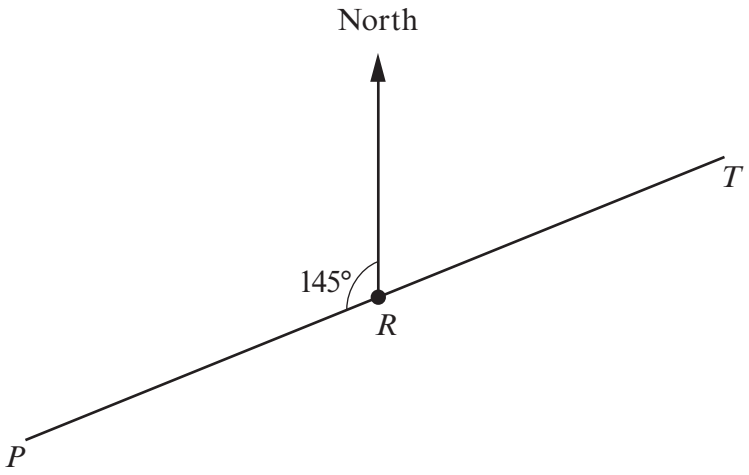


Diagram not drawn to scale

The above diagram shows three points *P, R* and *T* which lie on a straight line.
The bearing of *T* from *R* is 035°.
Calculate the bearing of *P* from *R*.

.....

.....

[2]

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4. *(a)* Expand $y(y^3 + 6)$.

.....

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[2]

(b) Solve $\frac{x}{3} + 54 = 63$.

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[2]

(c) Solve $\frac{36 - x}{4} = 10$.

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[3]

(d) Factorise $2x^2 - 4x$.

.....

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[2]

(e) Write down the nth term of the sequence 3, 7, 11, 15, 19, ...

.....

.....

[2]

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5. *(a)* Freddy goes to buy a ticket for a concert.
A sign by the ticket office states "20% off all original ticket prices".
Freddy comes away having paid a reduced price of £36.80 for his ticket.
What was the original price of Freddy's ticket?

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[3]

(b) Freddy is paid £x per hour.
How long, in minutes, will Freddy have to work for in order to earn £y? Give your answer in terms of x and y.

.....

.....

.....

[2]

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6. *(a)* Use the graph paper to find the coordinates of the point of intersection of the curve $y = x^2$ and the line $x + y = 8$ in the first quadrant.

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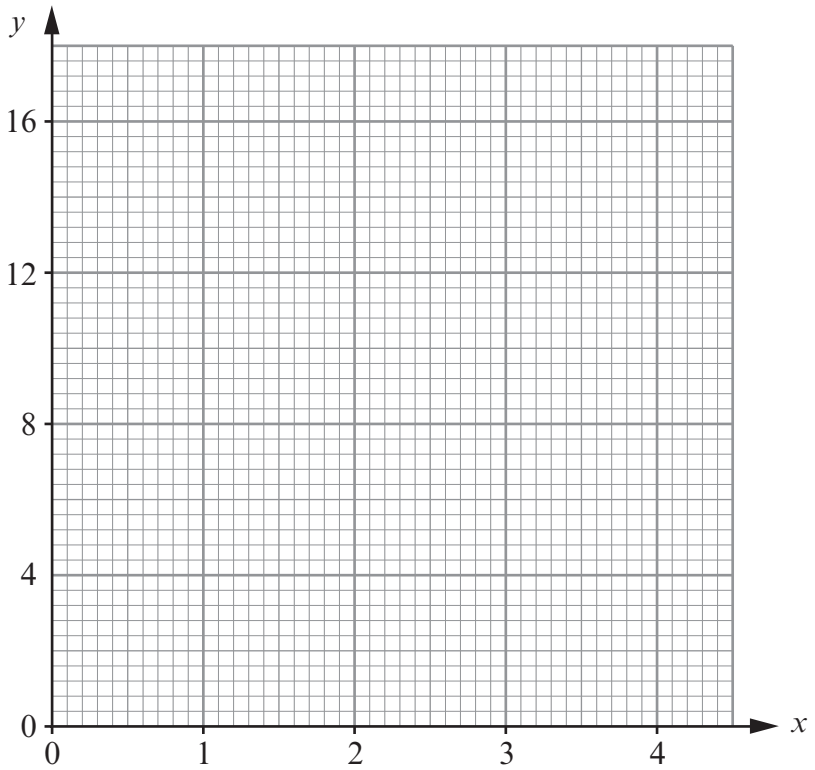
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[6]



(b) **State** whether or not it is possible to find a point of intersection of the following straight lines. Show how you have made your decision and give a reason for your answer.

$y = 3x + 4$ and $9x - 3y = 13$

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[3]

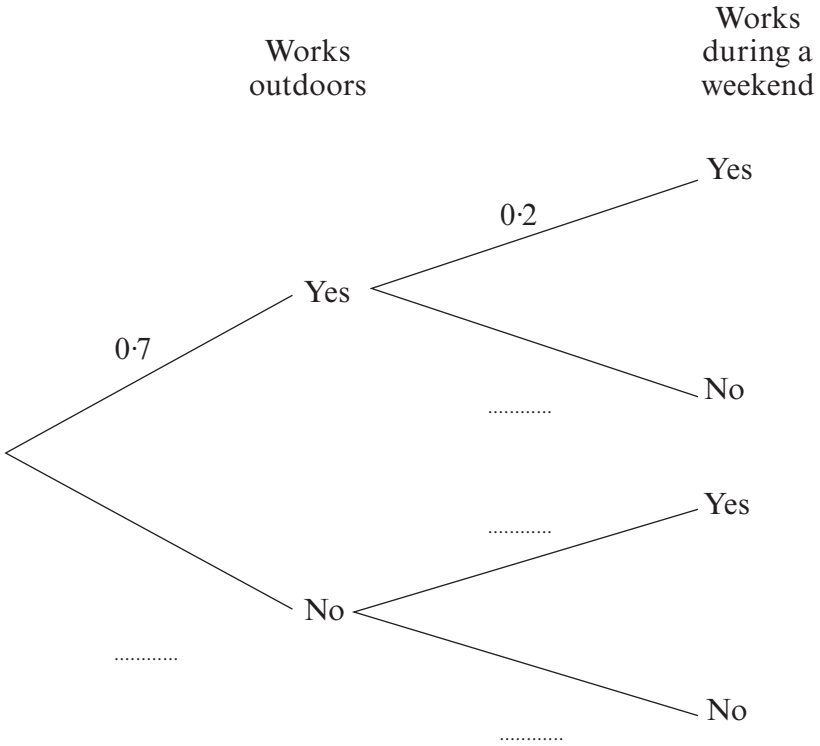
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7. Sasha works for a garden centre.
In any given week the probability that she works outdoors is 0·7.
The probability that she works during a weekend is 0·2.
Working outdoors and working weekends are independent events.

(a) Complete the following tree diagram.



[2]

(b) Calculate the probability that next weekend Sasha will work outdoors.

.....

.....

.....

[2]

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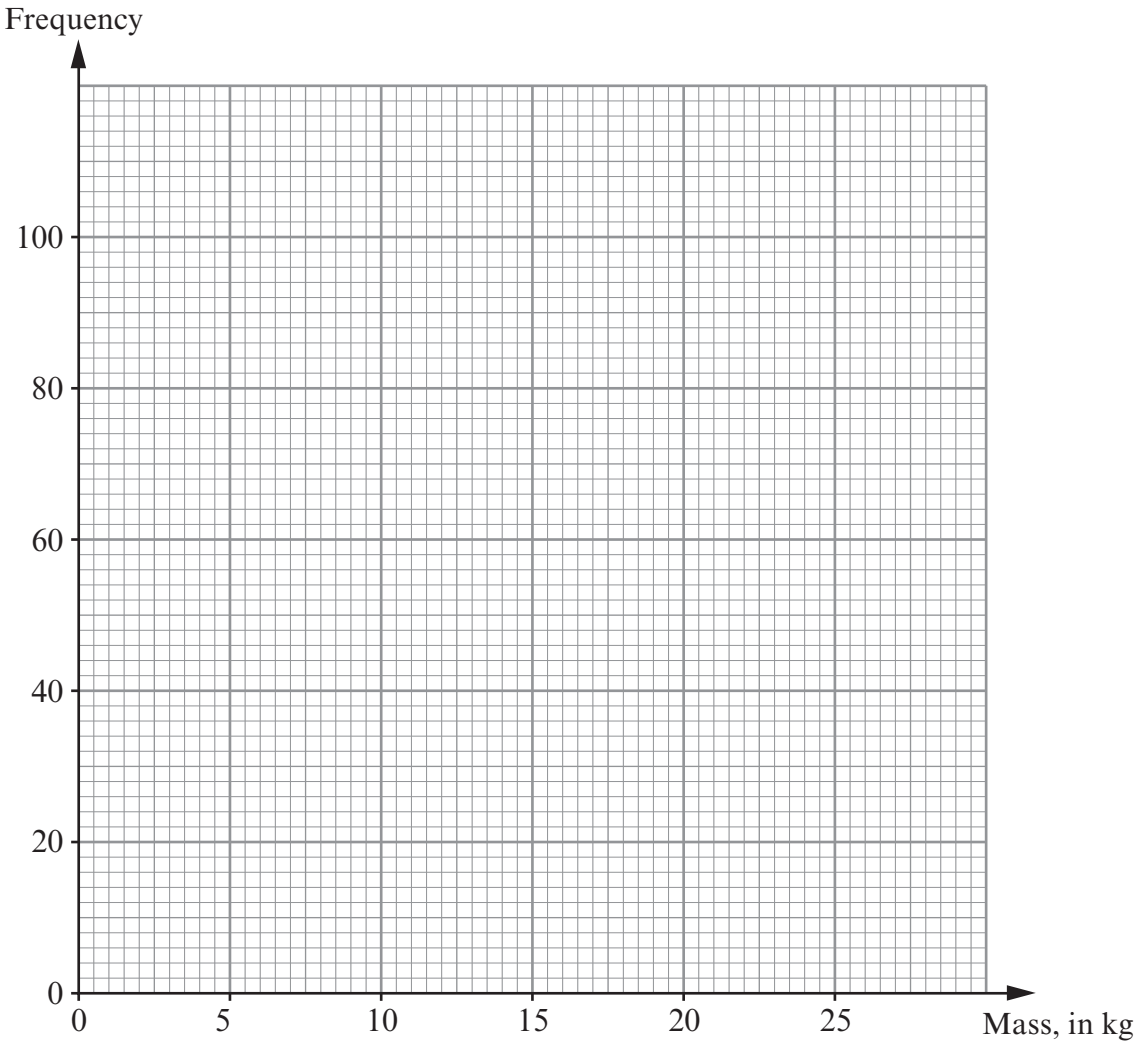
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8. *(a)* The total mass of tomatoes, in kg, produced by each of 200 plants in a greenhouse was measured.
The table shows the grouped frequency distribution for the total mass of tomatoes on each of these 200 plants.

Mass, x kg	$0 < x \leqslant 5$	$5 < x \leqslant 10$	$10 < x \leqslant 15$	$15 < x \leqslant 20$	$20 < x \leqslant 25$
Frequency	6	20	70	88	16

(i) On the graph paper below, draw a frequency diagram to show this data.

[2]



(ii) State which class interval contains the median.

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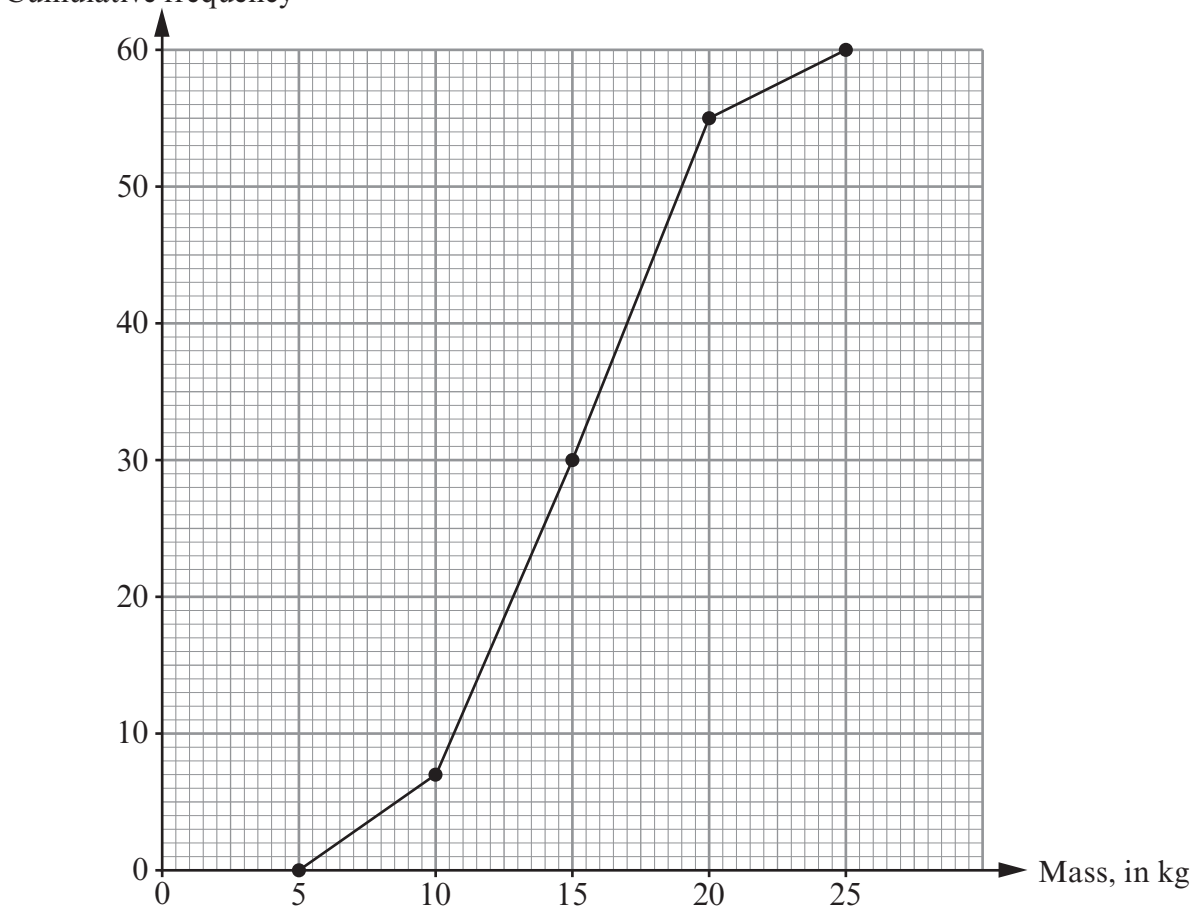
[1]

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(b) The total mass of tomatoes produced by each of 60 plants in a different greenhouse was measured. The following cumulative frequency graph illustrates the results.



(i) Complete the grouped frequency table of the total mass of tomatoes on each plant.

Mass, x kg	$0 < x \leqslant 5$	$5 < x \leqslant 10$	$10 < x \leqslant 15$	$15 < x \leqslant 20$	$20 < x \leqslant 25$
Frequency	0	7			

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.....

[2]

(ii) Use the cumulative frequency diagram shown above to find estimates for each of the following.

The median.

.....

The inter-quartile range.

.....

.....

[3]

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Turn over.

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9. *(a)* Evaluate each of the following.

(i) $2^5 - 11^2$

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[3]

(ii) 28^0

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[1]

(iii) $81^{\frac{1}{4}} \times 25^{-\frac{1}{2}}$

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[3]

(iv) $3{\cdot}4 \times 10^3 + 1{\cdot}2 \times 10^2$

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[2]

(b) Estimate the value of $\dfrac{19{\cdot}843^2 \times 0{\cdot}249}{0{\cdot}0099}$.

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[3]

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10. A cuboid with a volume of $912\,\text{cm}^3$ has dimensions $4\,\text{cm}$, $(x + 2)\,\text{cm}$ and $(x + 9)\,\text{cm}$.
Write down an equation in terms of x.
Hence, solve the equation to find the dimensions of the cuboid.

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[7]

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11. The coordinates of the point R are (a, b) where $a > 5$ and $b > 5$.
The point T is the reflection of the point R in the line $y = 1$.
Find the coordinates of the point T in terms of a and b.

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[5]

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12. *(a)* Find the value of $(\sqrt{45} - \sqrt{5})^2$.

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[3]

(b) Express $0{\cdot}\dot{4}\dot{7}\dot{8}$ as a fraction.

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[2]

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13. The points A, B and C lie on the circumference of a circle.
The straight line PBT is a tangent to the circle and $C\hat{B}P = x$, where x is measured in degrees.

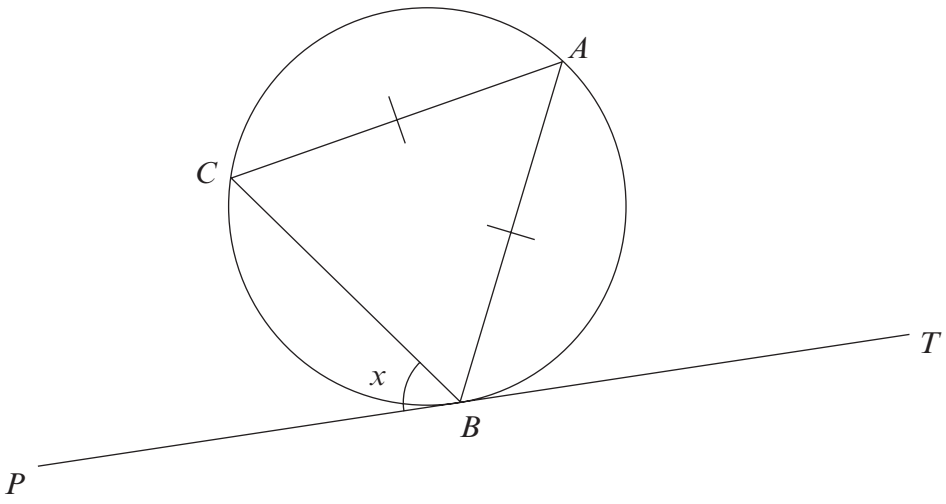


Diagram not drawn to scale

Show, giving reasons in your answer, that the size of $A\hat{B}C$ in degrees is $90 - \frac{1}{2}x$.

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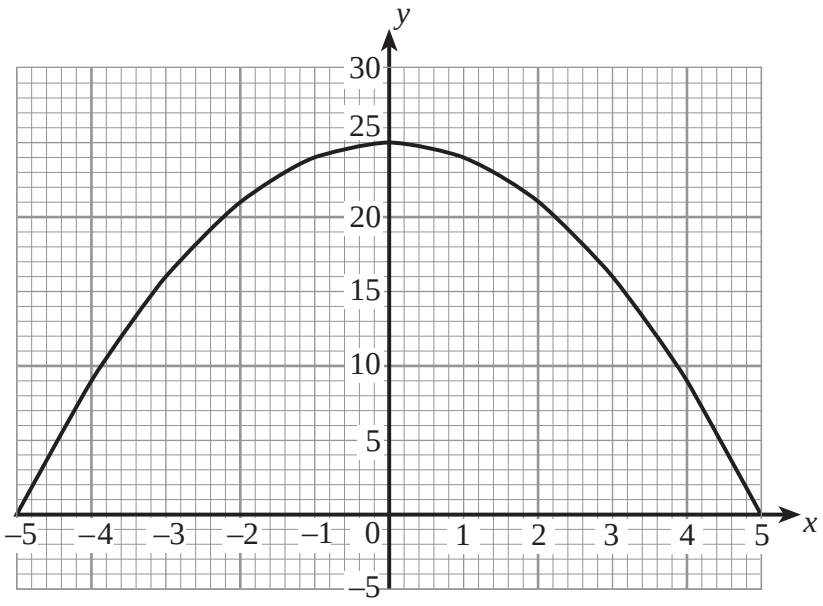
[2]

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14. The graph of $y = 25 - x^2$ has been drawn below.



(a) Write down the gradient of the curve $y = 25 - x^2$ at $x = 0$.

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[1]

(b) Find an estimate for the gradient of the curve $y = 25 - x^2$ at $x = 2$.

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[3]

(c) Use the trapezium rule, with the ordinates $x = 0$, $x = 1$, $x = 2$, $x = 3$, $x = 4$ and $x = 5$, to estimate the area of the region bounded by the curve, the positive x-axis and the positive y-axis.

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[4]

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Question number	Additional page, if required. Write the question numbers in the left-hand margin

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GCSE MARKING SCHEME

MATHEMATICS - LINEAR

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE MATHEMATICS - LINEAR. 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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P1 (HIGHER TIER)

Summer 2012 Paper 1 Linear Higher		FINAL MARK SCHEME Comments
1. w = 121° x = 142° y = 59° z = 83°	B4	B1 for each correct response FT y = 180 –w, z = w + x – 180 or z = x-y
2.(a) (The shape has) 5 sides or pentagon (Interior) 3×180 OR (Exterior) 360÷5 = 540 = 72 (Total of the other 2 angles or 2x =) 540 - 3×106 108×5 - 3×106 (So 1 remaining angle is or x=) 222÷2 = 111(°)	S1 M1 A1 M1 M1 A1	May be implied in working Accuracy required, answer only however gains M1, A1 FT their 540 or 108 (=180-their 72) Realising need to halve, as there are two other angles *Possible marks for candidates incorrectly believing, for example interior is 360° then: possible S1, M0, A0, then M1 for 360 - 3×106, then M1 for 42/2, and A1 for 21. Other examples are possible.* *Candidates thinking total of other 3 angles is 106, then for the final 3 marks, M0, possible M1for division by 2 and FT for possible A1 for correct evaluation*
Look for • relevance • spelling • clarity of text explanations, • the use of notation (watch for the use '=' and '° ' 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	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
2.(b) 7y + 32 + 3y + 50 + 8y – 10 = 180 18y + 72 = 180 OR 18y = 108 OR y = 108÷18 y = 6 74 68 38	M1 A1 A1 B2	Idea that all three total 180. Formal notation not required Formal notation not required CAO *Candidates that believe =360 will have y as 16 worth SC1, then FT for B2 for answers of 144, 98 and 118 (or B1 for any 1 correct)* FT their unique 'y' if clearly identifiable. B1 for any one correct entry. <u>Award also previous M1 A2 if any two correct entries seen</u>
3.(a) Correct enlargement Intention of correct position	B2 B1	B1 for any 1 line enlarged by scale factor 2
3.(b) Correct rotation	B2	B1 for a near miss or for 90° anticlockwise rotation
3.(c) 180 + 35 or equivalent 215(°)	M1 A1	Mark final answer

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Summer 2012 Paper 1 Linear Higher		FINAL MARK SCHEME Comments
4.(a) $y^4 + 6y$	B2	B1 for one correct term. If B2 penalise further working -1 Do not accept 6×y for 6y, however accept y6
4.(b) x/3 = 63 - 54 OR x/3 = 9 OR x + 3×54 = 3×63 OR x + 162 = 189 x = 27	M1 A1	 Award both marks for an embedded answer SC1 for an answer of 351
4.(c) 36 – x = 10×4 OR 9 – x/4 = 10 -x = 40 – 36 -x/4 = 10 – 9 x = -4 or -4 = x	B1 B1 B1	FT until 2nd error unless –x becomes x (as dropping the negative simplifies the question) Award all marks for an embedded answer Do not accept –x = 4 as a final answer, B1, B1, B0 *If no marks SC1 for* $\frac{36 + 4}{4} = 10$
4.(d) 2x(x -2)	B2	B1 for correct but only partially factorised OR for 2x(x …) or 2x(… -2)
4.(e) 4n – 1 or equivalent	B2	B1 for sight of 4n. Accept 4×n -1 or n4 -1 for B2 Accept N for n, but penalise other letters – 1. 4n – n gets B0
5.(a) Idea that 36.80 is 80% (36.80/80) × 100 (£)46	B1 M1 A1	 Or equivalent full method, e.g. sight of attempt ÷8 and × 10
5.(b) 60y/x	B2	Accept y/ (x/60) ISW. B1 for x/60 or y/x including embedded within an incorrect expression
6.(a) Attempt to find at least three points on $y=x^2$ $y=x^2$ drawn with (1,1) (2,4) (3,9) plottted and joined by curve For x+y=8: At least two points correct Line x+y=8 drawn accurately FT intersection their **curve** & their **straight line** (Approx (x = 2.3 or 2.4, y = 5.4 to 5.9 (not 6))	M1 A1 M1 A1 B2	 (0,0) and (4,16) may also be plotted, the other 3 must be there and accurate. Any error in (0,0) and (4,16) is A0. Must be the correct straight line B1 for x and B1 for y Coordinate notation not required, accept x=… and y=… Reading for x and y tolerance of 1 small square, 0.1 for x and 0.4 for y
6.(b)Strategy, e.g. attempt to form y=mx+c (to find gradient) Deducing that gradients are the same Statement that lines are parallel (or similar description)	S1 B1 E1	 Appropriate next step *Alternatively for simultaneous equations:* *Strategy: correct method to solve S1* *Stating 'they cannot be solved' B1* *Reason: 'they are parallel' E1*
7.(a) 0.3 0.8 0.2 0.8 on the correct branches	B2	B1 for any two correct entries Accept fractions
7.(b) 0.7 × 0.2 = 0.14	M1 A1	
8.(a)(i) Correct frequency diagram	B2	B1 for 3 correct bars, OR for translated frequency diagram horizontally by one small square. *B0 if both frequency diagram and frequency polygon given*
8.(a)(ii) $15 < x \leq 20$	B1	Accept any unambiguous indication of this interval.
8.(b)(i) 23, 25, 5 (ii) Median 15 (kg) Interquartile range: 18 - 11.5 to 12 Answers in the range 6 to 6.5 (kg)	B2 B1 M1 A1	B1 for any 1 correct entry CAO From a correct calculation if seen

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Summer 2012 Paper 1 Linear Higher		FINAL MARK SCHEME Comments
9.(a)(i) 32 - 121 = -89	B2 B1	B1 for 32 or 121 CAO
9.(a)(ii) 1	B1	
9.(a)(iii) 3 × 1/5 = 3/5	B2 B1	B1 for 3 OR 1/5 or 5^{-1} or $1/\sqrt{25}$ CAO
9.(a)(iv) 3400 + 120 = 3520 or equivalent ISW	M1 A1	Or $3.4\times10^3 + 0.12\times10^3$ 3.52×10^3
9.(b) Any **two** simplifications, such as 20^2, ¼, 0.01 All **three** simplifications with one stage of working, e.g. $\frac{400 \times ¼}{0.01}$ OR 400×25 OR $\frac{400 \times 0.2}{0.01}$ 10000 OR 10000 OR 8000	B1 M1 A1	Do not accept 0.5 as a reasonable simplification of 0.249, however do accept 0.2, 0.25, 0.3. Accept 0.009 as a simplification of 0.0099 May be shown in parts Accept other approximations following reasonable working
10. $4(x+2)(x+9) = 912$ $(x+2)(x+9) = 912/4$ OR $4(x^2 +2x + 9x + 18) = 912$ $x^2 +2x + 9x + 18$ (= 228) OR $4x^2 + 44x + 72$ (= 912) $x^2 +11x - 210 = 0$ OR $4x^2 + 44x – 840 = 0$ $(x + 21)(x – 10) = 0$ OR $4(x + 21)(x – 10) = 0$ x = 10 Dimensions (4cm) 12(cm) and 19(cm) only	B1 M1 M1 M1 A1 A1 A1	Right hand side may be inserted at a later stage FT until 2nd error FT equivalent level FT equivalent level. For the expression FT equivalent level Or factorised without the factor of 4 extracted, or equivalent Ignore negative value for x FT provided at least 2 M marks awarded No negative dimensions included *For candidates trying to find, from their equation, 2 numbers with a difference of 7 that give a product of 228, allow full credit for 12× 19(× 4)* *Trial and improvement methods from the start, or answers only, are awarded no marks*
11. Strategy, e.g. sketch with axes and with a horizontal line (y=1) with a point in the first quadrant above this horizontal line, and a point in the fourth quadrant vertically below their first point. *The two points do not need to be labelled, may be incorrectly labelled* *The horizontal line should be unambiguous, no credit if a vertical line also given* T (a, …) Method to find y-coordinate, e.g. sight of b-1 above y=1 T (… , 2-b) or equivalent	S2 B1 M1 A1	S2 for modelling using appropriate values, with a $\geq$ 5 or b $\geq$ 5 e.g. showing (6, 7) with (6, -5) (this example also gains M1 for trying to find the y coordinate) OR S1 for axes showing a horizontal line, or for the mirrored two points, or sight of 'b<-3' meaning y<-3 *Accept intention of y = 1 by indicating a horizontal line above the x-axis* Accept without coordinate notation OR for use of appropriate values to model, e.g. (.., 7) with (.., -5) OR sight of 'b<-3' meaning y<-3 Accept without coordinate notation
12. (a) $\sqrt{45} = \sqrt{(9 \times 5)}$ or $\sqrt{(3\times3\times5)}$ or $3\sqrt{5}$ { $(\sqrt{45} - \sqrt{5})^2$ } = $(3\sqrt{5} - \sqrt{5})^2$ (= $(2\sqrt{5})^2$) = 20	M1 M1 A1	**OR** M2 for $45 - 2\sqrt{45}\sqrt{5} + 5$ OR M1 for 2 of the 3 (or 4) expansion terms correct FT from M1 awarded
12.(b) x = 0.47878… **and** 100x = 47.878… with an attempt to subtract 474/990 ISW	M1 A1	Or 10x **and** 1000x with attempt to subtract, or equivalent. Or alternative method An answer of 47.4/99 gains M1 only
13. Angle CAB = x AND stating alternate segment theorem Stating triangle CAB isosceles AND (180 – x)/2	B1 B1	May be indicated on the diagram

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Summer 2012 Paper 1 Linear Higher		FINAL MARK SCHEME Comments
14.(a) 0	B1	
14.(b) Tangent drawn at x=2 Method, difference y / difference x Evaluated/ estimated answer from their reasonable tangent	B1 M1 A1	 Does not require leading to negative answer The answer must be negative
14.(c) Finding y values: 25, 24, 21, 16, 9, (0) Split into 5 areas and attempt to sum Correct substitution into trapezium rule 82.5	B1 M1 M1 A1	Sight of 25, 24, 21, 16, 9, (0) Or equivalent. (24.5+22.5+18.5+12.5+4.5) FT their values for y, OR 3 areas correct in sum of 5 CAO *Working with twice this, MR-1 then apply marks for equivalent stages*

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