



GCSE MARKING SCHEME

MATHEMATICS - LINEAR

NOVEMBER 2012

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.

PAPER 1 - FOUNDATION TIER

PAPER 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
1. (a) (i) 6 583 (ii) thirteen thousand four hundred and six 1. (b) 182 1. (c) 309 1. (d) 72 1. (e) (i) 8740 (ii) 8700 1. (f) 1, 2, 4, 8, 16	B1 B1 B1 B1 B1 B1 B2 9	B1 for any 3 correct factors with at most 1 incorrect number. <u>Allow 1×16, 2×8, 4×4 or repeats in a list.</u>
2. (a) 8 thousand(s) OR 8000 OR thousand(s) 2. (b) 81 2. (c) Tom spends £14 on cards Each pack costs (£)14/10 = (£)1.4(0) OR 140 (p) 2. (d) 25 (%) 2. (e) (74 OR 75 OR 74.6 OR 70 <u>OR 80</u>) × 100 = 7400 OR 7500 OR 7460 OR 7000 <u>OR 8000</u> 2. (f) 23	B1 B1 M1 M1 A1 B1 M1 A1 B1 9	<u>B0 for 1000</u> <u>Accept 9×9 OR 9², but 9 gets B0</u> Allow this M1 only for (£)15/10. <u>Unsupported (£)1.50 gets 0</u> C.A.O. <u>¼ OR .25 get B0.</u> Good estimates F.T their estimates for simple calculations Answers only get M0, A0.
3. (a) Profit = $20 \times 24 - 150$ = (£) 330 3. (b) Outlay = $10 \times 24 - 180$ = (£) 60	M1 A1 M1 A1 4	Correctly substituted shown by correct attempt to evaluate. <u>Must show that the substitution is 20×24 then – 150</u> For correct substitution with subtraction Allow embedded references to the correct answer.
4. (a) cone octagon (square based) pyramid OR <u>rectangular based pyramid</u> 4. (b) diameter tangent chord 4. (c) (i) All 3 lines of symmetry (ii) BOTH lines of symmetry	B1 B1 B1 B1 B1 B1 B2 B1 9	<u>Circular based pyramid gets B0</u> Triangular pyramid gets B0, but pyramid gets B1 B1 any one of them and no incorrect lines OR 2 correct lines and up to 1 incorrect line. B0 if any incorrect lines are drawn
5. (a) Missing side segment = 6 Perimeter = $10+2+10+2+10+6+10+2+10+2$ = 64 (cm) 5. (b) Area = $3 \times 10 \times 2$ = 60 cm ²	S1 M1 A1 M1 A1 U1 6	<u>This may be implied by some correct methods</u> Attempt to add all sides of the shape C.A.O. OR equivalent C.A.O. Independent of all other marks. <u>Watch out as the area of the 'gap' is also 60.</u>

PAPER 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
<p>6. <u>Finding the costs per pupil of tickets, bus and lunch</u> Cost of ticket per pupil = $915/98 = (\text{OR } 900/100)$ = (£)9</p> <p>Cost of bus per pupil = $290/98 = (\text{OR } 300/100)$ = (£)3</p> <p>Total cost per pupil = $\text{£}9 + \text{£}3 + \text{£}3.95 = \text{£}15.95$ = <u>(£)16</u> (to nearest £)</p>	<p>M1 A1</p> <p>M1 A1</p> <p>A1</p>	<p>Allow any method that implies estimating <u>Allow unsupported answers in the range 7-11 incl. But if working shown then mark it.</u></p> <p>Allow any method that implies estimating <u>Allow unsupported answers in the range 2-4 incl. But if working shown then mark it.</u></p> <p>F.T. if both Ms awarded <u>Must be rounded to the nearest £</u></p>
<p><u>OR</u> <u>Finding the TOTAL cost of tickets, bus and lunches /98</u> Total cost of lunches = $(\text{£})3.95 \times 98 = (\text{OR } \text{£}4 \times 100)$ = (£)400</p> <p>Total for the trip = $400 + 915 + 290 = (\text{OR } 400+900+300)$ = (£) 1600</p> <p>Cost per pupil = $(1605 \text{ OR } 1600)/100$ = <u>(£)16</u> (to nearest £)</p> <p><u>NOTE:</u> 98 ~ 100 (£)3.95 ~ (£)4 (£)915 ~ (£) 900 (£)290 ~ (£)300</p>	<p>M1 A1</p> <p>A1</p> <p>M1 A1</p>	<p>Allow any method that implies estimating <u>Allow estimated answers</u></p> <p>F.T. if M awarded</p> <p>Allow any method that implies estimating</p> <p><u>If no marks then SC1 for any 3 of these estimates</u></p>
<p><u>QWC</u> Look for</p> <ul style="list-style-type: none"> • Spelling • Clarity of text explanations • The use of notation – watch for ‘=’, ‘£’, ‘p’ being used appropriately. <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining their processes or steps <p>AND</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> • present work clearly, with words explaining their processes or steps <p>OR</p> <ul style="list-style-type: none"> • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer 	<p>QWC 2</p> <p>7</p>	<p>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.</p> <p>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar.</p> <p>OR</p> <p>Evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.</p> <p>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation and grammar.</p>

PAPER 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
7. Toronto down 5 Glasgow -4 Moscow down 4 Reykjavik -7	B1 B1 B1 B1 4	<u>If given as –5 then B0, but allow B1 if Moscow is given as –4</u>
8. (a) Overlay Plots Line	P1 L1	<u>A valid attempt at drawing a line/curve through the points</u>
8. (b) Any correct strategy, e.g. 2 times value at 20 kilometres per litre $56 \times 2 = 112$	M1 A1 4	Any correct method using graph or table. F.T. their graph. Unsupported answers in the range 108 – 116 <u>inclusive</u> get M1, A1.
9. (a) 5 3 (1 1) 3 1 (1 3) (1 1) 3 5 (1 3) 5 7 (b) $\frac{7}{16}$ (of 320) = 140 Cost = $320 \times 50(\text{p})$ OR Prizes = $140 \times 80 (\text{p})$ (£) 160 or 16000 (p) OR (£)112 or 11200 (p) <u>$320 \times 50(\text{p}) - \text{their } 140 \times 80 (\text{p})$</u> = £48 OR 4800p	B2 M1 A1 M1 A1 M1 A1 8	B1 for at least 4 correct entries <u>Negative numbers are errors in this table, but follow through, if needed in part (b)</u> F.T. their table. F.T. ‘their 7/16’ if a fraction less than 1 Sight of bone fide 140 in later working OR 140/320 gets M1, A1. Accept words ‘7 out of 16’, or ‘70 out of 160’ here. For either method and accuracy for cost OR prizes. F.T. ‘their 140’ provided it is clearly identifiable. <u>A0 for £16000 OR 160p OR 112p OR £11200</u> F.T. full method (ignore units for the M1). Rounded up or down figure if <u>their 140</u> is not a whole number
10. (a) Base angle = 66 x = $180 - 66 - 66$ <u>OR 114 – 66</u> = 48 10. (b) $(180 - 106) = 74$ $360 - 114 - 53 - 74$ = 119 (°)	B1 M1 A1 B1 M1 A1 6	<u>x = 66 with no working gets B1M0A0</u> F.T. their 180 – 114 For finding 4 th angle. Also look in their diagram. 74 on its own gets this B1, even as y = 74 Angle sum of quadrilateral. Note that $180 - 167 + 106$ is equivalent (114 + 53) F.T. ‘their 74’
11. A (9, 5) B (26, –4) C (21, –13)	B2 B2 B2 6	B1 for each ordinate B1 for each ordinate B1 for each ordinate. <u>F.T. ‘their B + (–5, –9)’</u>

PAPER 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
12.(a) (£)6400 (b) (£)2000 (c) Reasonable straight line of best fit (d) Negative (correlation) (e) FT from a line of best fit (reading accurate to small square) (curved line or straight line, not dot-to-dot) H1	B1 B1 B1 B1 B1 5	Some points above and some points below <u>Do not accept from ‘corner’ to ‘corner’ of the graph paper</u> OR an answer between (£)2600 and (£)3600 inclusive if no line of best fit.
13. (a) $3(8x + 1)$ (b) $x(x - 6)$ (c) $2x^4 + 12x$ (d) $x/3 = 25 - 15$ $x = 30$ F13 parts (a) to (d) are H4 parts (b) to (e) (e) $5x - 7 = 3x + 6$ $2x = 13$ $x = 6.5$ OR $6\frac{1}{2}$	B1 B1 B2 M1 A1 B1 B1 B1 9	CAO CAO B1 for each term. If B2 penalise further wrong work -1. Or alternate correct first step CAO. Accept embedded answers. <u>Mark final answer.</u> SC1 for $x=120$ from $x/3 = 40$, OR SC1 for ‘ladder method’ showing -15, $\times 3$ FT until 2 nd error OR $x = 13/2$ Must be simplified <u>SC1 for ‘ladder method’</u>
14.(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) (b) $(n - 2) \div 6$ OR $(n - 2)/6$ H5	S1 M1 M1 A1 B3 7	May be implied in later working that this is the arrangement Accept intention, not about notation <u>SC2 for 79 or SC1 for $(164 - 6)/2$</u> <i>Alternative:</i> <i>Any 3 multiples of 6 shown or 3 terms of a sequence going up in 6s, or $164/6$ or $164 \div 6$</i> S1 <i>$27 \times 6 = 162$ OR 27 remainder 2 OR $27.3(3..)$</i> M1 <i>(this implies S1 also)</i> <i>$162 + 2 = 164$ (seen or implied)</i> M1 <i>27 (tables)</i> A1 <i>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</i> <i>An answer of 27 (tables) without working is awarded SC3</i> <i>FT misunderstanding longer edges joined leading to $(n-6) \div 2$</i> <i>B2 for $n-2 \div 6$ or $n - 2/6$ or $-2 \div 6$</i> <i>B1 for -2 or $\div 6$ in an expression</i> <i>or $n = 6 \times \text{tables} + 2$, or $n = 6 \times t + 2$</i> <i>B0 for $\times 6 + 2$ or $n \times 6 + 2$</i>
15. Realising could be 2+2, 1+3, 3+1 Realising 36 different outcomes OR sight of $1/6 \times 1/6$ <u>OR product of 2 terms both with denominators of 6 seen</u> OR sight of a denominator of 36 $3/36$ or equivalent H6	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 <u>Maybe shown in a sample space diagram with indication of 36, must be stated not implied</u> Ignore incorrect cancelling
16. Middle card 6 Two cards (or three cards) 3 <u>as the mode for their cards</u> First card 1 and last card 9 (or in reverse) <u>Correct answer 1 3 3 6 7 8 9 or in reverse</u> H7	B1 B1 B1 B1 4	<u>If boxes are blank, mark the working</u> <u>Smaller numbers to one side and larger to the other</u> <u>3 is the distinct mode for their cards</u> <u>OR any pair of single digit numbers (including negatives) with a difference of 8</u> <u>CAO</u>

PAPER 1 - HIGHER TIER

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

PAPER 1 Higher Tier	Marks	FINAL MARK SCHEME Comments
<p>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)</p> <p>QWC0 for answer only</p> <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> present work clearly, maybe with diagrams and words explaining process or steps <p>AND</p> <ul style="list-style-type: none"> make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> present work clearly, maybe with diagrams and words explaining process or steps <p>OR</p> <ul style="list-style-type: none"> make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer <p>(b) $(n - 2) \div 6$ OR $(n - 2)/6$ OR equivalent</p>	<p>S1 M1</p> <p>M1</p> <p>A1</p> <p>QWC 2</p> <p>B3</p> <p>9</p>	<p>May be implied in later working that this is the arrangement</p> <p>Accept intention, not about notation. For a complete correct method that could lead to 27 tables</p> <p>SC2 for 79 or 54, or SC1 for $(164 - 6)/2$</p> <p><i>Alternative:</i> <i>Any 3 multiples of 6 shown or 3 terms of a sequence going up in 6s, or $164/6$ or $164 \div 6$</i> S1 <i>$27 \times 6 = 162$ OR 27 remainder 2 OR $27.3(3..)$ M1</i> <i>(this implies S1 also)</i> <i>$162 + 2 = 164$ (seen or implied) M1</i> <i>27 (tables) AI</i></p> <p><i>An answer of 27 from working '27 remainder 2' or '27.3(3..)' must be confirmed in order to award the final M1, AI (i.e. remainder justified), otherwise SC1 instead</i></p> <p>An answer of 27 (tables) without working is awarded SC3</p> <p>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.</p> <p>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.</p> <p>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</p> <p>FT misunderstanding longer edges joined leading to $(n - 6) \div 2$ B2 for $n - 2 \div 6$ or $n - 2/6$ or $-2 \div 6$ B1 for -2 or $\div 6$ in an expression or $n = 6 \times \text{tables} + 2$, or $n = 6 \times t + 2$ B0 for $\times 6 + 2$ or $n \times 6 + 2$</p> <p>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</p> <p>Ignore incorrect cancelling</p>
<p>6. Realising could be 2+2, 1+3, 3+1</p> <p>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</p>	<p>B1</p> <p>B1</p> <p>B1 3</p>	<p>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</p> <p>Ignore incorrect cancelling</p>

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	If boxes are blank, mark the working 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 2 nd error FT “their” primes, needs to have at least 1 index > 1 Or $1\frac{1}{9}$ 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 $6x^2(\dots) - 20$ B1 for $(2x \dots 3)(x \dots 1)$ or $(2x \dots 1)(x \dots 3)$ FT from their pair of brackets CAO. Mark final answer B1 for $(1)n^2 \pm \dots$, 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 $(9+2x)(5+2x) - 9 \times 5$ 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 $\frac{1}{4}$ circles in corners OR sight of πx^2 of a fraction or multiple of πx^2 (or equivalent) $9x+9x+5x+5x+4 \times \frac{1}{4} \times \pi \times x^2$ $28x + \pi x^2$ 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 πx^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 $(\frac{1}{2}(3) + \frac{1}{2}(3+4) + \frac{1}{2}(4+3) + \frac{1}{2}(3))$ (+ 60 if below x-axis included) CAO
13. $y \propto 1/x^2$ 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 $y \propto 1/x$ or $y \propto x^2$ for possible M1, A1

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 $100x = 65.252\dots$ and $x = 0.652\dots$ $646/990$ 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

PAPER 2 - FOUNDATION TIER

PAPER 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
1. (a) (242.68) 146.16 (tables) 87.5(0) (chairs) 160.56 (cabinets) (£) 636.9(0) (b) Builder pays (£) 573.21	B1 B1 B1 B1 B2 6	 F.T. their figures for 1 error F.T. their total rounded or truncated. <u>Must be in 2 dec. places for the B2</u> B1 for a correct 10% (£) 63.69. <u>2 dec. pl. NOT required for B1</u>
2. 50g 500kg 50mg 50kg 27 litres 270 ml 2.7 cm ³ 270litres 180cm 18m 180mm 1800cm 266mm 266cm 266m 266km	B1 B1 B1 B1 4	
3. (a) Evidence of square counting 72 – 78 (<u>inclusive</u>) 3. (b) Lines Arc 3. (c) c a b	M1 A1 B1 B1 B1 B1 B1 7	 Correct curvature starting and ending at the candidate's 2 lines. <u>If angle values used then they must be appropriate on the diagram AND in the correct place on the answer line.</u>
4. (a) Spring (S) 10, Summer (U) 15, Autumn (A) 8, Winter (W) 7 Both axes labelled, e.g. frequency along one axis and Spring (S), Summer (U), Autumn (A), Winter (W) along other axis (or on the bars) Anywhere within the base (inc.) of the corres. bar. and uniform scale for the frequency axis starting at 0 and labelled 'frequency' OR 'number of pupils'. Four bars at correct heights (bars must be of equal width). Can be in any order. (b) Summer OR U (c) 7/40 I.S.W.	B2 B2 B2 B1 B2 9	May be inferred from their bar chart. B1 for any two/three correct frequencies If frequencies score 0, then give B1 for all 4 correct tallies. B1 if no scale, but allow one square to represent 1 OR B1 if not labelled as 'frequency' or similar. If frequency scale starts with 1 at the top of the first square the starting at 0 will be implied for this axis. <u>Condone frequency numbers alongside square instead of at the top of the squares.</u> F.T. their frequencies throughout. B1 for any 2 or 3 correct bars on F.T. If no frequencies given in their working, penalise –1 for each incorrect frequency on their bars up to –4 (First and third B2s) Accept 15 and (Summer OR U), but B0 for 15 only B1 for the 7 (in a fraction < 1) OR B1 for a denominator of 'their 40' (in a fraction < 1). <u>F.T. their frequencies.</u> Penalise –1 for incorrect notation, e.g. '7 out of 40', '7:40' Allow decimals and percentages including on F.T. For example, (0).175 or 17.5% for 7/40

PAPER 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments									
5. (a) <div style="text-align: center;"> </div> (b) likely	B1 B1 B1 B1 4	A should be between $\frac{1}{2}$ and $\frac{3}{4}$ (Accept P for A). <u>A should be to the right of the halfway and up to alongside the gap between the a and l in ball (OR between ê and l in pêl in the Welsh version)</u> B should be at 1. C should be between 0 and $\frac{1}{4}$ (Accept G for C). <u>C should be to the right of the 0 and up to alongside the y in probability (OR the y in tebygolrwydd in the Welsh version)</u>									
6. <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">$(\frac{1}{4})$</td> <td style="text-align: center;"><u>(0.25)</u></td> <td style="text-align: center;">(25%)</td> </tr> <tr> <td style="text-align: center;"><u>any fraction equiv. to $\frac{6}{10}$</u></td> <td style="text-align: center;">(0.6)</td> <td style="text-align: center;"><u>60(%)</u></td> </tr> <tr> <td style="text-align: center;"><u>any fraction equiv. to $\frac{3}{4}$</u></td> <td style="text-align: center;">(0.75)</td> <td style="text-align: center;">(75%)</td> </tr> </table>	$(\frac{1}{4})$	<u>(0.25)</u>	(25%)	<u>any fraction equiv. to $\frac{6}{10}$</u>	(0.6)	<u>60(%)</u>	<u>any fraction equiv. to $\frac{3}{4}$</u>	(0.75)	(75%)	B1 B1, B1 B1 4	<u>ISW for the fractions $\frac{6}{10}$ and $\frac{3}{4}$</u> <u>Do not accept fractions like $\frac{7.5}{10}$</u>
$(\frac{1}{4})$	<u>(0.25)</u>	(25%)									
<u>any fraction equiv. to $\frac{6}{10}$</u>	(0.6)	<u>60(%)</u>									
<u>any fraction equiv. to $\frac{3}{4}$</u>	(0.75)	(75%)									
<u>All triangles must be 'base' side to 'base' side</u> 7. (a) Rhombus <u>OR square</u> Sketch 7. (b) Kite Sketch	B1 B1 B1 B1 4	<u>Mark name first then sketch</u> B0 for what looks more like a parallelogram than rhombus <u>Mark name first then sketch</u>									
8. (a) (i) Decrease previous term by 7 (ii) Multiply previous term by -2 8. (b) (i) $10w$ (ii) $x - 6$ and $x + 6$ 8. (c) $\frac{1}{9} \times 45 = 5$ and $4 \times 5 = 20$ 8. (d) $5 \times 4 = 2P + 3 \times -4$ $2P = 20 + 12$ OR 32 $P = 16$ 8. (e) $4x = 18$ $(x =) 4\frac{1}{2}$ OR 4.5	B1 B1 B1 B1 M1 A1 B1 B1 B1 B1 B1 11	Accept -7 . <u>B0 for $n - 7$</u> Accept $\times -2$ <u>B0 for $n \times -2$</u> <u>Allow $10 \times w$, $w \times 10$ and $w10$. Ignore any g(rams)</u> <u>Ignore $w =$ and $=w$</u> For both Any correct method Correct substitution, not awarded until the 2 multiplications are seen to be implemented. <u>Sight of 20 and -12 gets B1 F.T.</u> $P = 32/2$ gets B0. Must be 16 F.T. $P =$ 'their $32/2$. <u>Allow embedded answers, such as $20 = 2 \times 16 - 12$.</u> <u>Must be 18 NOT 21-3</u> $(x =) 18/4$ gets B0. <u>($x =$) $9/2$ gets B0</u>									
9. (a) yuan = 700×9.79 <div style="text-align: right;">$= 6853$ (yuan) <u>ISW</u></div> 9. (b) Pounds = $2447.5/9.79$ <div style="text-align: right;">$= (\pounds) 250$ <u>ISW</u></div>	M1 A1 M1 A1 4	Yuan not required but A0 for £6853 £ not required but A0 for 250 yuan									

PAPER 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
10. (a) (10) 17 24 31 (b) (35 31) 27 23 19 (c) <u>(Yes)</u> because 100 is 60 away and 60 is divisible by 6 (d) After 5 steps 75 (e) Starting numbers are 44 apart. 44 is divisible by 4	B1 B1 E2 B1 B1 B1 B1 8	E2 for $6 \times 10 + 40$ OR equivalent, <u>e.g. Yes, in 10 steps (E2)</u> E1 for considering 60 with an indication of steps of 6 e.g. listing all numbers between 40 to 100. <u>75 can be answered in lists, but the 5 must be given as an answer.</u> Allow <u>B1</u> for sight of 44 <u>OR 40 by comparing 21 and 61 after one step etc.</u> SC1 for only listing the correct sequences.
11. (a) $(\hat{ACB}) = 60^\circ$ $(\hat{BCE}) = 45^\circ$ $(\hat{ACE}) = 105^\circ$ 11. (a) (continued) QWC Look for <ul style="list-style-type: none"> Spelling Clarity of text explanations Some geometrical statements, e.g. angles of an equilateral triangle are 60° QWC2: Candidates will be expected to <ul style="list-style-type: none"> present work clearly, with words explaining their processes or steps AND <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> present work clearly, with words explaining their processes or steps OR <ul style="list-style-type: none"> make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer 	B1 B1 B1 QWC 2	Look for the angles shown in their diagram (Angles of an equilateral triangle are 60°) (Half the angle of a square is 45°) C.A.O. 105° with NO supporting work gets 0. QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling
11. (b) First arcs Final arcs and line 11. (c) First arcs Final arcs and line	B1 B1 B1 B1 9	<u>If no pair of compasses used (i.e no arcs) then 0 for their work in (b) and (c)</u> <u>They can use the points A and B for this first B1</u> <u>Remember the 2 methods discussed in the conference.</u>
Use Overlay 12. Bearing from Holyhead Bearing from Cardigan Position of Ship	M1 M1 A1 3	Use Overlay Within $\pm 2^\circ$. <u>Watch out for unambiguous 'dots' within the boundaries of the overlay and award M1s F.T. provided at least M1</u> <u>One unambiguous 'dot' within the 'box' on the overlay gets all 3 marks.</u>

PAPER 2 (Calculator allowed) Foundation Tier		Marks	FINAL MARK SCHEME Comments																																																																			
13. One correct evaluation (1 dec.pl.) of x^3-7x-2 $2 \leq x \leq 3$ Watch for pupils who are trying to make x^3-7x equal to 2 rather than x^3-7x-2 equal to 0. Two correct evaluations (1 dec.pl.) x^3-7x-2 $2.65 \leq x \leq 2.85$ which give opposite signs for f(x). Two correct (OR F.T.) evaluations (1 dec.pl.) $2.75 \leq x \leq \underline{2.85}$ which give opposite signs for f(x). Thus solution is 2.8 correct to 1 decimal place. <u>Note that candidates must give a method that proves the solution is 2.8 correct to 1 decimal place.</u> <u>Just stating 0.3520 is closer than -1.217 is NOT enough</u>		B1 B1 M1 A1 4	Calculations should be accurate to 1 decimal place rounded or truncated If no calculations are given accept use of “too low” or “too high” OR >0 and <0. <u>Useful Data</u> <table><tr><td>2</td><td>-8</td><td>2.7</td><td>-1.217</td><td>2.65</td><td>-1.9404</td></tr><tr><td>2.1</td><td>-7.4390</td><td>2.71</td><td>-1.067489</td><td>2.66</td><td>-1.7989</td></tr><tr><td>2.2</td><td>-6.7520</td><td>2.72</td><td>-0.916352</td><td>2.67</td><td>-1.6558</td></tr><tr><td>2.3</td><td>-5.9330</td><td>2.73</td><td>-0.763583</td><td>2.68</td><td>-1.5112</td></tr><tr><td>2.4</td><td>-4.9760</td><td>2.74</td><td>-0.609176</td><td>2.69</td><td>-1.3649</td></tr><tr><td>2.5</td><td>-3.8750</td><td>2.75</td><td>-0.453125</td><td>2.8</td><td>0.3520</td></tr><tr><td>2.6</td><td>-2.6240</td><td>2.76</td><td>-0.295424</td><td>2.81</td><td>0.5180</td></tr><tr><td>2.7</td><td>-1.2170</td><td>2.77</td><td>-0.136067</td><td>2.82</td><td>0.6858</td></tr><tr><td>2.8</td><td>0.3520</td><td>2.78</td><td>0.024952</td><td>2.83</td><td>0.8552</td></tr><tr><td>2.9</td><td>2.0890</td><td>2.79</td><td>0.187639</td><td>2.84</td><td>1.0263</td></tr><tr><td>3</td><td>4</td><td>2.8</td><td>0.352</td><td>2.85</td><td>1.1991</td></tr></table>		2	-8	2.7	-1.217	2.65	-1.9404	2.1	-7.4390	2.71	-1.067489	2.66	-1.7989	2.2	-6.7520	2.72	-0.916352	2.67	-1.6558	2.3	-5.9330	2.73	-0.763583	2.68	-1.5112	2.4	-4.9760	2.74	-0.609176	2.69	-1.3649	2.5	-3.8750	2.75	-0.453125	2.8	0.3520	2.6	-2.6240	2.76	-0.295424	2.81	0.5180	2.7	-1.2170	2.77	-0.136067	2.82	0.6858	2.8	0.3520	2.78	0.024952	2.83	0.8552	2.9	2.0890	2.79	0.187639	2.84	1.0263	3	4	2.8	0.352	2.85	1.1991
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14.(a) 23 (m) (b) $(12+24) \div 4$ 9 (car lengths) (c) <table><tr><th colspan="2">Speed</th></tr><tr><td>mph</td><td>km/h</td></tr><tr><td>30</td><td>48</td></tr><tr><td>70</td><td>112</td></tr></table> (d) $15 + 0.30 \times 15$ OR $38 + 0.20 \times 38$ or equivalents 19.5 and 45.6 65(.1 m)		Speed		mph	km/h	30	48	70	112	B1 M1 A1 M1 A2 M1 A2 A1 10	Evidence of a method, e.g. $\div 5$ and $\times 8$, or $\times 5$ and $\div 8$ as appropriate, or sight of a correct scale, e.g. $80 \times 30 / 50$ A1 for either answer correct. Also implies M1 A1 for either correct answer. Accept 20 and 46 FT from M1, A1 FT from rounding to ‘their 20’+ ‘their 46’ = 66(m) Unsupported 65 or 66 gain full credit <u>If no marks, award SC1 for an answer of 12.1 or 12 (giving the increase not the total).</u>																																																											
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15. 654 173.31 203.76 10.18(8) 171.58(8) 20.91(2) CR	a b c d e	B1 B1 B1 B1 B1 B1 6	F.T. $a \times 0.265$ F.T. $b + 30.45$ F.T. $c \times 0.05$ <u>B0 if 105% given here</u> F.T. $c + d - 42.36$ F.T. $e - 192.50$ Allow $\pm 2p$	Accept truncated or rounded answers If their total cost is < 192.50 then their final balance must show – or CR. If their total cost is > 192.50 then B0.																																																																		
16. (a) Area = $\frac{1}{2} \times 8.6 \times 4.1$ 17.6(3 cm ²) (b) $(AB^2 =) 8.6^2 + 4.1^2$ OR $73.96 + 16.81$ $(AB^2 =) 90.77$ $(AB) = 9.5(273..) (cm)$ Perimeter = $12.7 + 9.5 = 22.2 (cm)$ = 22 (cm)		M1 A1 M1 A1 A1 M1 A1 7	Correct substitution in Pythagoras' Theorem <u>This work could be seen in (a) and should be credited appropriately.</u> <u>FT their 8.6+4.1+ 'their AB if from Pythagoras work'</u> Given to 2 sig. figs.																																																																			

PAPER 2 - HIGHER TIER

PAPER 2 Higher Tier	Marks	FINAL MARK SCHEME Comments								
1. a = 76(°) b = 53(°) c = 51(°)	B1 B1 B1 3	FT 180 – (a + b)								
2.(a) 23 (m) (b) (12+24)÷4 9 (car lengths) (c) <table border="1"><tr><th colspan="2">Speed</th></tr><tr><th>mph</th><th>km/h</th></tr><tr><td>30</td><td>48</td></tr><tr><td>70</td><td>112</td></tr></table> (d) 15 + 0.30 × 15 OR 38 + 0.20 × 38 or equivalents 19.5 and 45.6 65(.1 m)	Speed		mph	km/h	30	48	70	112	B1 M1 A1 M1 A2 M1 A2 A1 10	Evidence of a method, e.g. ÷5 and ×8, or ×5 and ÷8 as appropriate, or sight of a correct scale, e.g. 80 × 30 /50 A1 for either answer correct. Also implies M1 A1 for either correct answer. Accept 20 and 46 FT from M1, A1 FT from rounding to ‘their 20’+ ‘their 46 ‘= 66(m) Unsupported 65 or 66 gain full credit If no marks, SC1 for an answer of 12.1 or 12 (giving the increase not the total)
Speed										
mph	km/h									
30	48									
70	112									
3.(a) Scale factor 2 enlargement (Intention of the) Correct position (b) Correct rotation about (2, 1)	B1 B1 B2 4	Perhaps watch for the position of the bottom left vertex B1 for rotation of 180° about (1, 2)								
4. Janie 450/1.57 or Ami 30000/129.82 Janie (£)286.6242... or (£)286.62 Ami (£)231.0892.. or (£)231.08 or (£)231.09 or (£)231 (£)186.62 and 131.09 Sight of an amount (not starting dollars or yen) × 1.18 669.9(0 euros) or 669 (euros) or 670 (euros) Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of ‘=’, £, \$, Yen 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 A1 B1 M1 A1 QWC 2 8	Allow (£)286.6(0) Allow (£)231.1(0) FT correctly subtracting (£)100 from each of their amounts, but not from 450 or 30000 For method of conversion, even if £250 not added FT their (amounts in £s) rounded or truncated, e.g. leading to 669.88. Must be FT for the 3 girls e.g. {186. (..)+ 131.(...) + 250}× 1.18 correctly evaluated, rounded or truncated MR-1 for treat situation of exchange of money for whole notes 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.								

PAPER 2 Higher Tier	Marks	FINAL MARK SCHEME Comments						
5.(a) 7.6 (cm) (b)(i) Mid-points 5,6,7,8,9 $5 \times 4 + 6 \times 2 + 7 \times 1 + 8 \times 1 + 9 \times 2$ Intention their $\sum fx / 10$ 6.5 (cm) (ii) Modal class $4.5 \leq s < 5.5$ Median $5.5 \leq s < 6.5$	B1 B1 M1 m1 A1 B1 B1 7	FT their mid points including bounds provided they fall within the classes. $20 + 12 + 7 + 8 + 18 (= 65)$ (65/10) For correct evaluation of $\sum fx / 10$ Accept '4.5 to 5.5' Accept '5.5 to 6.5'						
6.(a) Radius 2.3 $\Pi \times 2.3^2 \times 8.4$ $139.5(998 \dots \text{cm}^3)$ to $139.7(\text{cm}^3)$ (b)(i) $(x^2 =) 3.4^2 + 5.6^2$ $x^2 = 42.92$ or $x = \sqrt{42.92}$ 6.6 (cm) (ii) $\frac{1}{2} \times 5.6 \times 3.4$ $9.5(2 \text{ cm}^2)$	B1 M1 A1 M1 A1 A2 M1 A1 9	Do not accept from premature approximate SC1 for an answers $558(.3992 \dots \text{cm}^3)$ to $558.7(\text{cm}^3)$ Depends on previous M1 and process of $\sqrt{}$. Mark final answer. A1 for 6.5(51... cm) Mark final answer						
7.(a) Correct frequency polygon (b) 22 60 90 100 (c) Uniform scale vertically Plotting all points at the upper bounds All 6 accurate upper bound plots joined with a curve or lines (d)(i) Median for their graph (ii) Idea UQ – LQ, with an attempt at readings and intention to subtract Interquartile range accurate for their graph	B2 B1 B1 B2 B1 B1 M1 A1 10	Must be accurate between bounds of 1 small square horizontally and on the line vertically B1 if translated OR joined with curve or not joined OR one plot incorrect within the polygon <i>Ignore frequency diagram as working</i> Appropriate for their values in (b) FT their <u>cumulative</u> table only if cumulative Ignore if (50, 0) omitted Must be accurate on vertical lines and horizontal lines B1 if one error in plots, OR for all vertical plots correct but not at upper bounds FT from their <u>cumulative</u> graph in (d)(i) and (ii) (Answer in the range 63.5 to 64 (cm)) (67 to 68 - 60 to 60.5) (Answers in the range 6.5 to 7.5)						
8.(a)(i) <table border="1"><tr><td>45.5</td><td>46.5</td></tr><tr><td>54.5</td><td>55.5</td></tr><tr><td>61.5</td><td>62.5</td></tr></table> (ii) $161296(.875 \text{ cm}^3)$ or $161297 (\text{cm}^3)$ ISW (b) Least: $(x-0.5)(y-0.5)(z-0.5)$	45.5	46.5	54.5	55.5	61.5	62.5	B2 B2 B2 6	B1 for any 3 correct entries Accept .49' RECURRING as being equivalent to .5 FT their greatest provided all $>$ given values and $<47, <56$ and <63 respectively B1 for selection of 46.5 (\times) 55.5 (\times) 62.5 (sight of digits 161296 or 161297). Allow SC1 for an answer of 164.5, or for selecting and recording addition for their greatest values B1 for minor slip, or omission of brackets, there needs to be intention to multiply, or if further incorrect working B0 for sight of the 3 terms only without intention to multiply
45.5	46.5							
54.5	55.5							
61.5	62.5							
9. $\tan A = 3.2/7$ $24.567 \dots (^\circ)$ rounded or truncated	M1 A2 3	A1 for 0.457... or $\tan^{-1} 3.2/7$ SC1 for calculating B , an answer of 65.43... (°), this is not for an answer labelled as A						

PAPER 2 Higher Tier	Marks	FINAL MARK SCHEME Comments
10.(a) Method, equating coefficients or alternative First variable correct Method to find second variable Second variable correct (b) $11(3 + x) + 2(2x - 1) = 13 \times 2 \times 11$ $15x + 31 = 286$ $x = 17$ (c) $7r - ar = b - c$ $r(7 - a) = b - c$ $r = (b - c)/(7 - a)$ or equivalent	M1 A1 M1 A1 M2 A1 A1 B1 B1 B1 11	Allow 1 slip, but not in equated coeffs. $x = 11$ $y = -3$ FT their first variable No M mark if left as quotient M1 for 2 of these 3 terms correct FT from M1 for A1 only CAO (Must be simplified) Like terms <i>FT until second error</i> Factorise Isolate
11.(a) 0.05 (b) 1.1×10^{-4}	B1 B2 3	Accept equivalents, 1/20 B1 for 1×10^{-4} or 1.11×10^{-4} or $1.111... \times 10^{-4}$ SC1 FT from their (a)/450 correctly expressed in standard form
12.(a) $(y =) 360 - 2x$ or $(y =) 2(180 - x)$ ISW (b) $\angle FGH = 90^\circ$ seen or implied by used in calculation $FH = 6.8 / \sin 32$ ($\times \sin FGH$) $FH = 12.8(32.. \text{ cm})$ or 13 (cm)	B2 B1 M2 A1 6	B1 for <u>appropriate</u> $2x$, or $180 - x$ may be seen on the diagram or labelled, OR B1 for $x = (360 - y)/2$, or a correct expression but not ' $y=..$ ' M1 for $\sin 32 = 6.8 / FH$ or $FH / \sin FGH = 6.8 / \sin 32$ Answer of 12 gets A0
13. <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;"> Three sides' or SSS </div> <div style="border: 1px solid black; padding: 2px;"> Two sides and INCLUDED angle' or SAS </div>	B1 B1 2	<u>Accept descriptions</u> Do not accept e.g. 'dashes in the same places' Must be clear that it is the included angle
14. Strategy to find $(\frac{1}{2})$ PQ and $\angle PBQ$ $PQ^2 = 4^2 + 6^2 - 2.4.6.\cos 82$ $PQ^2 = 45.31969...$ $PQ = 6.73199...$ $PQ^2 = 8^2 + 8^2 - 2.8.8.\cos \angle PBQ$ $\cos \angle PBQ = \frac{8^2 + 8^2 - PQ^2}{2.8.8}$ $\angle PBQ = 49.763...(^{\circ})$ Area shaded = $(\angle PBQ / 360) \times \pi \times 8^2$ $= 27.79.. (\text{cm}^2)$ or 28 (cm^2) or 27.8(cm^2)	S1 M1 A1 A1 M1 A1 A1 M1 A1 9	Maybe embedded OR <i>Alternative:</i> $\sin \frac{1}{2} \angle PBQ = \frac{1}{2} PQ / 8$ M1 $\angle \frac{1}{2} \angle PBQ = 24.88...$ A1 $\angle PBQ = 49.763...(^{\circ})$ A1 Accept answers in the range 49.5 to 49.8 inclusive, or 50 Correct answer, not FT FT their $\angle PBQ$ provided not 82 and all M marks awarded Accept answers in the range 27.6 to 28 inclusive
15.(a) Decision to find overall totals of a, e, r and number of letters 34/132 or 0.2575... or equivalent (b) Use or sight of (a, e, r) = 34 AND (number of letters =) 132, OR, sight of any correct probability product, equivalent to $.. / 132 \times .. / 131$ (or $... / 66 \times ... / 65$) as appropriate $P(\text{at least one of } a, e, r) = 1 - P(\text{none})$ OR equivalent full strategy $1 - 98/132 \times 97/131$ or equivalent full method 0.45	M1 A1 B1 S1 M1 A2 7	(34 and 132) Mark final answer Accept sight of 34 and 132, or 17 and 66. FT from (a) For the idea without need to use values (As $66 = 132 \div 2$) FT their <u>totals</u> , a method that would lead to correct answer A1 for answer not correct to 2dp, as a result of incorrect or premature rounding <i>N.B. Markers check working for no replacement</i>
16. Cosine curve from 0° to 360° Correct cosine curve with the correct translation, with 2 marked on the y-axis	M1 A1 2	Any vertical translation, but must be correct horizontally Accept if numbers of degrees missed but unambiguous



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