

Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics (2AM01)
Higher Paper 2H

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NOTES ON MARKING PRINCIPLES

- 1** All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- 2** Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- 3** All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- 4** Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- 5** Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- 6** Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.
 - ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
 - iii) *organise information clearly and coherently, using specialist vocabulary when appropriate.*
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme

M1 – method mark
A1 – accuracy mark
B1 – Working mark
C1 – communication mark
QWC – quality of written communication
oe – or equivalent
cao – correct answer only
ft – follow through
sc – special case
dep – dependent (on a previous mark or conclusion)
indep – independent
isw – ignore subsequent working

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
*1	$180 - 125 = 55$ $90 - 55$ or $360 - 125 - 90 = 145$ $180 - 145$	35	3	M1 for a correct first step to find an angle which will lead to x e.g $180 - 125$ or $360 - 125 - 90$ A1 $x = 35$ C1 (dep M1) One relevant reason eg Alternate angles are equal
2		1800 1125 1575	3	M1 $27 \div 12 (= 2.25)$ M1 800×2.25 or 500×2.25 or 700×2.25 A1 all three answers correct or M1 $800 \div 12 (= 66.6\dots)$ or $500 \div 12 (41.6\dots)$ or $700 \div 12 (= 58.3\dots)$ M1 $27 \times 66.6\dots$ or $27 \times 41.6\dots$ or $27 \times 58.3\dots$ A1 all three answers correct

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
3	(a)	0.32	2	M1 $1 - (0.35 + 0.26 + 0.07)$ or $1 - "0.68"$ A1 cao
	(b)	0.42	2	M1 $0.07 + 0.35$ or $1 - ("0.32" + 0.26)$ A1 oe
	(c)	175	2	M1 500×0.35 A1 cao
4	(a)	10 00	1	B1 10 00 oe
	(b)	15 to 16	1	B1 15 to 16
	(c)	1.5	1	B1 1.5 oe
	(d)	(on graph)	2	B1 line joining (11 10, 3) to (11 20, 3) B1 line joining (11 20, 3) to (11 40, 4) SC If B0, B0 award B1 for line joining (11 10, 3) to (11 30, 4)

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
5		$T=20p+50b$	3	B3 $T = 20p + 50b$ (B2 $20p + 50b$ as an expression not in a formula or $T = k + 50b$ oe or $T = 20p + k$ oe $k \neq 0$) (B1 for $T = cp + db$, c and d numerical and not both zero or $k + 50b$ oe or $20p + k$ oe any $k \neq 0$)
*6	eg $1.4 \div 0.35 \times 10$ or 40 $98 \div 40 = 2.45$ $84 \div 36 = 2.33\dots$ or $1.4 \div 0.35 \times 10 = 40$ $84 \div 36 \times 40 = 93.(333\dots)$	white bread	4	M1 for correct method to convert to consistent units M1 for correct method which would enable a comparison of the number of calories per gram in each bread A1 for two appropriate correct values C1(dep M2) for white bread from their comparison

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
7		153	4	M1 $\pi \times 9.8$ (= 30.(7916...)) or $\pi \times 4.9$ (= 15.(3938..)) M1 15.25×4 (= 61) or 30.5×2 (= 61) M1 (dep on first M1) for a correct method to find the total length of all lines A1 152 -153
8		760	3	M1 $4560 \div "2 + 7 + 3"$ M1 "380" $\times 2$ A1 cao
9	$(14.3^2 - 6.2^2) \div 19.6$ $= (204.49 - 38.44) \div 19.6$ $= 166.05 \div 19.6$	8.5	2	M1 $\frac{14.3^2 - 6.2^2}{19.6}$ A1 8.45 - 8.5
10	(a)	Equation shown	2	M1 $x(x-1)(x+1)$ or $x(x^2-1)$ A1 (dep on M1) for expansion and equating to 16

Question	Working	Answer	Mark	Notes																																						
	(b) <table border="1" data-bbox="465 343 748 1145"> <thead> <tr> <th>x</th> <th>$x^3 - x$</th> </tr> </thead> <tbody> <tr><td>2</td><td>6</td></tr> <tr><td>3</td><td>24</td></tr> <tr><td></td><td></td></tr> <tr><td>2.5</td><td>13.125</td></tr> <tr><td>2.6</td><td>14.976</td></tr> <tr><td>2.7</td><td>16.983</td></tr> <tr><td>2.8</td><td>19.152</td></tr> <tr><td>2.9</td><td>21.489</td></tr> <tr><td></td><td></td></tr> <tr><td>2.61</td><td>15.16958</td></tr> <tr><td>2.62</td><td>15.36473</td></tr> <tr><td>2.63</td><td>15.56145</td></tr> <tr><td>2.64</td><td>15.75974</td></tr> <tr><td>2.65</td><td>15.95963</td></tr> <tr><td>2.66</td><td>16.161096</td></tr> <tr><td>2.67</td><td>16.364163</td></tr> <tr><td>2.68</td><td>16.568832</td></tr> <tr><td>2.69</td><td>16.775109</td></tr> </tbody> </table>	x	$x^3 - x$	2	6	3	24			2.5	13.125	2.6	14.976	2.7	16.983	2.8	19.152	2.9	21.489			2.61	15.16958	2.62	15.36473	2.63	15.56145	2.64	15.75974	2.65	15.95963	2.66	16.161096	2.67	16.364163	2.68	16.568832	2.69	16.775109	2.7	4	B2 for trial $2.6 \leq x \leq 2.7$ evaluated (B1 for an evaluated trial) B1 for different trial $2.65 \leq x < 2.7$ evaluated B1 (dep on at least one previous B1) for 2.7 Values evaluated can be rounded or truncated, but to nearest whole number when x has 1 dp or less, and to 1 dp when x has 2 dp
x	$x^3 - x$																																									
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Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
11		100	4	<p>M1 correct method to work out one part of the cross-sectional area M1 correct method to work out total cross-sectional area M1 cross - sectional area $\times 5$ A1 cao</p> <p>or</p> <p>M1 correct method to work out one part of the volume M1 correct method to work out a second part of the volume M1 correct method to work out total volume A1 cao</p>
12		27	4	<p>M1 for use of Pythagoras' rule M1 $14.3^2 + 22.9^2$ M1 $\sqrt{728.9}$ oe A1 27</p>

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
*13	$S = 3 \times 11 - 25$ $S = 8$ $E = 33 + 8$ $E = 41$ Or $38 = S + 33$ $S = 5$ $S = 3 \times 11 - 25$ $S = 8$	No the shoes won't fit	3	M1 $S = 3 \times 11 - 25$ M1 $E = 33 + "8"$ C1 (dep on M1) 41 and 'the shoes will not fit' or M1 $38 = S + 33$ or $S = 38 - 33$ or $S = 5$ M1 $S = 3 \times 11 - 25$ or $S = 33 - 25$ or $S = 8$ C1 (dep on M1) 8 and 5 and 'the shoes will not fit'
14		Correct diagram	2	B1 correct bearing (within guidelines) B1 correct distance (within guidelines) (see overlay)
15		12	4	M1 $x, \frac{x}{2}, \frac{x}{2} - 5, 9$ M1 $x + \frac{x}{2} + \frac{x}{2} - 5 + 9 < 30$ M1 correct method to isolate x A1 cao

Paper 5AM2H_01					
Question		Working	Answer	Mark	Notes
16	(a)		3	3	M1 tangent drawn at $t = 6$ M1 height \div base for a triangle with the tangent as hypotenuse A1 2.5 to 3.5
	(b)	$\frac{16-2}{8-3}$ $\frac{14}{5}$	2.8	2	M1 difference in depths \div (8 – 3) A1 2.7 – 2.9
17		$8 + 8 + 2 \times 8 \sin 20^\circ$ $16 + 2 \times 2.73(6\dots)$ $16 + 5.47(2\dots)$	21.5	4	M2 correct method to find RL (M1 for $8 \sin 20^\circ$ or $8 \cos 70^\circ$ or correct substitution into cosine rule or sine rule) M1 $8 + 8 + "2 \times 8 \sin 20^\circ"$ oe A1 21.4 to 21.5
18		$99.75 \div 66.5$	1.5	4	B1 99.75 or 99.65 or 99.7499 (recurring) B1 67.5 or 66.5 or 67.499 (recurring) M1 for $\text{miles}_{\text{max}} \div \text{speed}_{\text{min}}$ eg "99.75" \div "66.5" A1 1.5 from correct figures

Paper 5AM2H_01					
Question	Working	Answer	Mark	Notes	
*19	(a)	0.6 0.3, 0.9	2	B1 0.6 B1 0.3 and 0.9	
	(b)	no she does not need to hire the luxury room	4	M1 0.4×0.7 or 0.6×0.1 or 0.28 or 0.06 M1 $0.4 \times 0.7 + 0.6 \times 0.1$ or "0.28" + "0.06" A1 0.34 oe C1 (dep M1) luxury room not needed from their figures	
20		$\pi \times 3.2^2 \times 12 = 15.36 \pi = 386.0389$ Volume factor = $386.0389 \div 48.25 = 8.008$ Length scale factor = $\sqrt[3]{8.008} = 2$ $12 \div 2$ or $\pi \times (3.2x)^2 \times 12x = 48.75$ $x^3 = \frac{48.25}{\pi \times 10.24 \times 12} = 0.125$ $x = 0.5$ 0.5×12	6 cm	5	M1 for method to find the volume of the real can M1 for method to find the volume scale factor M1 for method to find the length scale factor M1(dep M3) $12 \div "2"$ or $12 \times "0.5"$ A1 5.9 to 6.1

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
	$\frac{1}{2} (0 + 2 \times 5 + 2 \times 8 + 2 \times 9 + 2 \times 8 + 2 \times 5 + 0)$ $= \frac{1}{2} (0 + 10 + 16 + 18 + 16 + 10 + 0)$ $= 70 \div 2$ <p>or</p> $\frac{1}{2} (0 + 2 \times 5 + 2 \times 8 + 9) = \frac{1}{2} (0 + 10 + 16 + 9)$ $= 35 \div 2 = 17.5$ 17.5×2			(A1 for $33 \leq \text{area} < 35$)
21		$\frac{17}{40}$	3	M1 $\frac{4}{5} \times \frac{3}{8}$ or $\frac{1}{5} \times \frac{5}{8}$ or $\frac{12}{40}$ or $\frac{5}{40}$ M1 $\frac{4}{5} \times \frac{3}{8} + \frac{1}{5} \times \frac{5}{8}$ A1 $\frac{17}{40}$ oe

Paper 5AM2H_01																				
Question	Working	Answer	Mark	Notes																
22	(a)	$d = \frac{7000}{c}$	2	M1 $d = k \div c$ or $25 = k \div 280$ A1 oe																
	(b)	20	2	M1 $d = \frac{7000}{350}$ A1 cao or M1 $25 \times 280 \div 350$ oe A1 cao																
23	eg <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>0</td> <td>5</td> <td>8</td> <td>9</td> <td>8</td> <td>5</td> <td>0</td> </tr> </table>	x	-3	-2	-1	0	1	2	3	y	0	5	8	9	8	5	0	36	4	M1 for attempting to find area under curve M1 for correct method to find the area under the curve between $x = -3$ and $x = 3$ (at least 3 areas) A2 for 35 – 36
x	-3	-2	-1	0	1	2	3													
y	0	5	8	9	8	5	0													
*24		7.07m	4	M2 $3^2 + 4^2 + 5^2$ or $9 + 16 + 25$ or 50 (M1 for correct use of Pythagoras in 2D to find a length) M1 $\sqrt{3^2 + 4^2 + 5^2}$ or $\sqrt{"9"+"16"+"25"}$ or $\sqrt{50}$ C1 (dep on M1) correctly found the shortest distance with 7.07(10678.....) and the correct units																

Paper 5AM2H_01				
Question	Working	Answer	Mark	Notes
25		21 or 22	5	<p>M1 for $160r^2=90$ or $\frac{90}{160}$</p> <p>M1 for $(r=)\sqrt{\frac{90}{160}}$ oe</p> <p>M1 (dep M2) for $160 \times \left(\sqrt{\frac{90}{160}}\right)^7$ oe</p> <p>A1 for 21.3...</p> <p>A1 for 21 or 22</p> <p>or</p> <p>M1 for $160 \times r^2 = 90$ or $\frac{90}{160}$</p> <p>M1 for $160 \times \frac{100-n}{100} \times \frac{100-n}{100} = 90$</p> <p>M1 (dep M2) for 160×0.75^7</p> <p>A1 for 21.3...</p> <p>A1 for 21 or 22</p>

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