

Mark Scheme (Results)

Summer 2013

GCSE Mathematics Linked Pair Pilot
Application of Mathematics (2AM01)
Higher (Calculator) Paper 1H

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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 labeling 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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: 5AM1H_01					
Question		Working	Answer	Mark	Notes
1		$12.15 \div 9 \times 5$	6.75	2	M1 for $12.15 \div 9 \times 5$ A1 cao
2		$\frac{12.5}{100} \times 860$	107.50	2	M1 for $\frac{12.5}{100} \times 860$ oe A1 for 107.50 or 107.5 SC: B1 for £752.5(0) without M1 scored
3	(a)		Suitable question with response boxes	2	B1 for a question about number of holidays within a time frame OR question about frequency of holidays with time frame(s) in response boxes. B1 for at least 3 correctly labelled non-overlapping response boxes (need not be exhaustive) OR 3 or more exhaustive response boxes which may overlap. [Do not accept inequalities in response boxes] NB Frequency tables or data collection sheets score B0
	(b)		Suitable reasons	2	B2 for two correct reasons relating to the types below (B1 for any one correct reason) Bias relating to gender with reason. Bias relating to travel agents with reason. Sample not random with reason. Sample size too small.

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Question		Working	Answer	Mark	Notes
*4		$20 \div 1.58$ (12.65...) $300 \div 12.65..=23.7$	23	4	M1 for $20 \div 1.58$ (12.65...) M1 for $300 \div '12.65.'$ (=23.7) or repeated addition or repeated subtraction A1 for 23.7 C1 for 23 clearly identified as final answer or M1 for 300×1.58 (=474) M1 for '474' $\div 20$ (=23.7) or $460 \div 20$ A1 for 23.7 or 460 and 23 C1 for 23 clearly identified as final answer
5	(a)		56.5	1	B1 cao
	(b)		57.5	1	B1 for 57.5 (accept 57.499... or 57.49 with 9 shown to be recurring)
6			(6, 5.5)	2	M1 for complete correct method to find x or y coordinate A1 cao

PAPER: 5AM1H_01				
Question	Working	Answer	Mark	Notes
7	$240 \div 5 (=48)$ $240 \div 8 \times 3 (=90)$ $240 - '48' - '90'$	102	3	<p>M1 for correct method for number in First class $240 \div 5 (= 48)$ or number in Business class $240 \div 8 \times 3 (= 90)$ M1 (dep) for $240 - '48' - '90'$ A1 cao</p> <p>OR</p> <p>M1 for attempt to find common denominator to add $\frac{1}{5}$ and $\frac{3}{8}$ with at least one fraction correct OR $\frac{23}{40}$ M1 (dep) for $[1 - (' \frac{8}{40}' + ' \frac{15}{40} ')] \times 240$ A1 cao</p> <p>OR</p> <p>M1 for attempt to convert both $\frac{1}{5}$ and $\frac{3}{8}$ to decimals with at least one decimal 0.2 or 0.375 correct OR 0.575 M1 (dep) for $[1 - ('0.2' + ' 0.375 ')] \times 240$ A1 cao</p>
8	<p>(a)(i)</p> <p>(a)(ii)</p>	$= C2 + C3 + C4 + C5$ $= B2 * C2$	3	<p>B1 for (=) $C2 + C3 + C4 + C5$ or (=)SUM(C2:C5) or clear intention to add correct cells</p> <p>B1 for (=) $B2 * C2$ or (=) $B2 * C2 / 100$ or clear intention to multiply correct cells.</p> <p>C1 for correct spreadsheet notation for both. Condone missing = sign. NB: do not accept 'x' in place of '*'</p>

PAPER: 5AM1H_01					
Question		Working	Answer	Mark	Notes
9	(a)	$15 \div 60$	25p	2	M1 for $15 \div 60$ oe or clear attempt to find gradient A1 for £0.25 or 25p
	(b)	$0.2 \times 90 (=18)$ From graph 90 units costs £19	Yes as cost will be lower	3	M1 for Tariff B price for 90 units $20 \times 90 (=1800)$ or $0.2 \times 90 (=18)$ OR Tariff A price per unit $\frac{1900}{90}$ or $\frac{19}{90}$ B1 for reading from Tariff A graph at 90 units or £19 C1 for £18 and £19 with 'yes' or 21.(1...)p with 'yes' OR M1 for drawing the correct line (for Tariff B) through the origin with gradient 0.2 B1 for reading from Tariff A graph at 90 units or 19 seen C1 for £18 and £19 with 'yes'
10	(a)	$36 \div 9 \times 6.4$	25.6	2	M1 for $36 \div 9$ or $9 \div 36$ or $\frac{36}{9}$ oe or $\frac{9}{36}$ oe A1
	(b)		No with explanation	2	M1 for $(12.8 \div 6.4)^2$ or $(18 \div 2)^2$ or 2^2 or 4 C1 for No with 4 and explanation showing area of C3 envelope is $4 \times$ area of C5 envelope. OR M1 for $9 \times 6.4 (=57.6)$ or $12.8 \times 18 (=230.4)$ or correct diagrammatic representation C1 for No with 57.6 and 230.4 and explanation showing area of C3 envelope is $4 \times$ area of C5 envelope or 115.2 and area of C3 envelope is not $2 \times$ area of C5 envelope.

PAPER: 5AM1H_01				
Question	Working	Answer	Mark	Notes
11	$2.4 \div 0.3 = 8$ $1.8 \div 0.3 = 6$ $8 \times 6 = 48$ $48 \div 14 = 3.42\dots$ $2.4 \times 1.8 = 4.32$ $0.3 \times 0.3 = 0.09$ $4.32 \div 0.09 = 48$ $48 \div 14 = 3.42\dots$	4	5	<p>B1 for correct conversion of units M1 for correct attempt to find how many rows of tiles using their units consistently. M1 for complete correct method to find the number of tiles needed. M1 for number of tiles $\div 14$ and round up A1 cao for 4 packs of tiles supported by correct working</p> <p>B1 for correct conversion of units M1 for correct method for Area of wall and Area of tile using their units consistently. M1 for complete correct method to find the number of tiles needed. M1 for number of tiles $\div 14$ and round up A1 cao for 4 packs of tiles supported by correct working</p>
12	$x + 3x + 3x + 4 = 158$ $7x + 4 = 158$ $7x = 154$	22	4	<p>M1 for $3x$ or $3x + 4$ seen M1 (dep) for forming equation $x + '3x' + '3x+4' = 158$ M1 for intention to isolate x term(s) in their equation if of the form $ax + b = 158$ A1 22 cao dep on at least M1 awarded</p> <p>OR</p> <p>M1 for a correct trial with $x \geq 1$ to evaluate x, $3x$ and $3x + 4$ (algebraic expressions may not be seen) M1 for 3 values that sum to 158 M1 for intention to add $22 + 3 \times 22 + 3 \times 22 + 4 (=158)$ A1 for 22 cao dep on at least M1 awarded</p>

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Question	Working	Answer	Mark	Notes																				
13	$60 - 29 = 31$ $13 - 8 = 5$ $31 - 10 - 5 = 16$ <table border="1" data-bbox="450 502 716 646"> <tr> <td></td> <td>Th</td> <td>C</td> <td>It</td> <td></td> </tr> <tr> <td>W</td> <td>6</td> <td>15</td> <td>8</td> <td>29</td> </tr> <tr> <td>M</td> <td>16</td> <td>10</td> <td>5</td> <td>31</td> </tr> <tr> <td></td> <td>22</td> <td>25</td> <td>13</td> <td>60</td> </tr> </table>		Th	C	It		W	6	15	8	29	M	16	10	5	31		22	25	13	60	16	4	<p>M1 for calculation of total Men $60 - 29 (=31 \text{ Men})$ M1 for calculation for Men who like Italian $13 - 8 (= 5 \text{ Men like Italian})$ M1 for calculation for Men who liked Thai '31' - $10 - '5'$ A1 for 16</p> <p>OR</p> <p>M1 for a 2-way table or diagram with clear labelling showing at least 3 pieces of the given information correctly placed M1 for correct method for one calculated entry in diagram: Men $60-29(=31)$ or Women and Chinese $29-8-6(=15)$ or Men and Italian $13-8(=5)$ M1 for 3 correct entries for Men or 2 correct entries for Thai that with correct arithmetic would lead to 16 (Men and Thai) A1 for 16</p>
	Th	C	It																					
W	6	15	8	29																				
M	16	10	5	31																				
	22	25	13	60																				

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Question	Working	Answer	Mark	Notes	
14	(a)	$\frac{700}{28000} \times 100$	2.5	2	M1 for $\frac{700}{28000} \times 100$ oe A1 cao
	(b)		3413.64	3	M1 for 3000×0.04 oe (=120) M1 for $(3000 + '120') \times 1.046^2$ oe A1 cao or M2 for $3000 \times 1.04 \times 1.046^2$ or 3000×1.13788064 (M1 for 3000×1.04 or 3000×1.046) A1 cao SC: B2 for 3413.6419....
	(c)		4.4%	3	M1 for $1.04 \times 1.046 \times 1.046$ (= 1.1378...) or $\frac{3413.64}{3000}$ (= 1.1378...) M1 for $\sqrt[3]{1.1378...} - 1$ (= 0.0439...) A1 4.39 – 4.4
15	(a)		box plot	2	B2 for fully correct box plot (B1 for 3 correctly plotted values with box or whiskers)
	(b)		comparisons	2	C1 for comparison of medians in context implied by height or taller/shorter C1 for comparison of range for boys and for girls.

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Question		Working	Answer	Mark	Notes
16	(a)		cf graph drawn	2	M1 for 4 of 5 points plotted consistently within each interval A1 for a fully correct cf graph
	(b)		Correct percentage consistent with appropriate method used	4	B1 ft read off at cf=64 from a cf graph tolerance $\frac{1}{2}$ square M1 for $(112 - '102')$ (= 10) M1 for $(112 - '102') \div 120 \times 100$ A1 ft dependent on previous M1
17		$\frac{1}{2}(2x - 10 + 5x + 20)$ $= 3x + 20$ $7x + 10 = 6x + 40$ $x = 30$ $3 \times '30' + 20$	110	6	M1 for $\frac{1}{2}(2x - 10 + 5x + 20) \times 80$ or $(3x + 20) \times 80$ M1 for setting up correct equation and dealing with $\frac{1}{2}$ correctly M1 for correct method to isolate terms in x in their equation A1 for $x = 30$ M1 ft for $3 \times '30' + 20$ A1 for 110 Or M1 for $\frac{1}{2}(2x - 10 + 5x + 20)$ M1 for $\frac{1}{2}(2x - 10 + 5x + 20) = (3x + 20)$ and dealing with $\frac{1}{2}$ correctly M1 for correct method to isolate terms in x A1 for $x = 30$ M1 ft for $3 \times '30' + 20$ A1 ft for 110

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Question		Working	Answer	Mark	Notes
18	(a)		6.244×10^8	1	B1 cao
	(b)	$1.25 \times 10^9 \div 4.14 \times 10^7$	30	2	M1 for $1.25 \times 10^9 \div 4.14 \times 10^7$ (=30.1932...) A1 for 30 – 30.2
	(c)	$78.3 \times 10^6 \times 5 \div 8$	50 000 000	2	M1 for correct method to convert 78.3×10^6 to miles eg $78.3 \times 10^6 \times 5 \div 8$ (=48 937 500) A1 for 50 000 000 or 5×10^7
19		$578 \div 0.85$	680	3	M1 for 100% – 15% (=85%) or $1 - 0.15$ (=0.85) oe M1 for $578 \div 0.85$ A1 cao
20		$67 + 52 + 124 + 63 = 306$ $\frac{124}{306} \times 50$ (=20.26...)	20	2	M1 for $\frac{124}{306} \times 50$ (=20.26...) or 20.26... A1 cao
21		$4x + 3y = 695$ $5x + 2y = 720$ $8x + 6y = 1390$ $15x + 6y = 2160$ $7x = 770$ $x = 110$ $y = 85$	Coffee £1.1(0) Tea 85p	5	M1 for attempt to use variables for cost of cup of tea and cost of a cup of coffee. A1 for correct equations : $4x + 3y = 695$ and $5x + 2y = 720$ oe M1 for correct process to eliminate either x or y (condone one arithmetic error) could be by multiplication of both equations and then addition/subtraction or by manipulation of one equation and then substitution into second equation M1 (dep) for substituting found value into either equation A1 for correct answers with units

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Question		Working	Answer	Mark	Notes
22	(a)	$18x + 12y \leq 360$	$3x + 2y \leq 60$	2	M1 $18x + 12y$ linked to 360 A1 for complete correct algebraic process leading to $3x + 2y \leq 60$
	(b)		Graph	4	M1 for $2x = y$ drawn M1 for $3x + 2y = 60$ drawn M1 for $x + y = 24$ drawn A1 for indicating correct region
	(c)		$20x + 15y$	1	B1 for $20x + 15y$
	(d)		420, 12, 12	3	M1 for attempt to find profit at any point of intersection eg. $15 \times 16 + 20 \times 8$ or line $20x + 15y = k$ drawn M1 for identifying point where maximum profit occurs A1 for 420, 12, 12 cao
23	(a)	$2.5 \times 20 + 7.5 \times 13 + 15 \times 10 + 30 \times 7$ $= 50 + 97.5 + 150 + 210$ $= 507.5$	10.15	4	M1 for finding fx consistently within interval including end points (allow 1 error) M1 (dep) for use of all correct midpoints M1 (dep on first M) for $\frac{\sum fx}{\sum f}$ A1
	(b)	$507.5 \div 50$ $20 \div 5, 13 \div 5, 10 \div 10, 7 \div 20$	Histogram with frequency density labelled	3	M1 for $20 \div 5 (=4)$ or $13 \div 5 (=2.6)$ or $10 \div 10 (=1)$ or $7 \div 20 (=0.35)$ A1 for bars of consistent areas for all given frequencies B1 for frequency density axis labelled Or M1 for 3 or more bars of consistent area drawn A1 for bars of consistent area for all given frequencies B1 for frequency density axis labelled

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

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Question	Modification	Notes
Q09	x-axis: 1.5 cm for 10. y-axis: 1.5 cm for £2,50 Top row of grid removed. Graph line: (0,0) to (60, 15) as standard paper. Then from (60, 15) to end going through (110, 20)	<p>B1 for reading from Tariff A graph at 90 units (accept £17 - £19) M1 for Tariff B price for 90 units $20 \times 90 (=1800)$ or $0.2 \times 90(=18)$ OR Tariff A price per unit “18”/90 C1 for correct conclusion for £18 (for tariff B) and their Tariff A price or 20p with “no difference” oe</p> <p>OR B1 for reading from Tariff A graph at 90 units (accept £17 - £19) M1 for drawing the correct line (for Tariff B) through the origin with gradient 0.2 C1 for correct conclusion for £18 (for tariff B) and their Tariff A price</p>

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Question	Modification	Notes
Q15	Values changed in table: 154 changed to 155, 160 stays the same, 172 changed to 175, 178 changed to 180, 191 changed to 195. 2 cm grid.	Standard mark scheme
Q16	Cumulative frequencies: 10, 60, 90, 110, 120 grid: 2 cm for 10 on both axes. (b): 64 to 80 changed to 65 to 80.	B1 ft read off at cf = 65 from a cf graph tolerance 5mm M1 for $(110 - '95')$ (= 15) M1 for $(110 - '95') \div 120 \times 100$ A1 ft dependent on previous M1
Q23	2 cm grid.	Standard mark scheme
Q17	x changed to y	Variable changed x to y
Q18	Top row removed from the table. Wording changed from seven planets to six planets.	Standard mark scheme
Q22	Grid: 1.5 cm for 2.5 on both grids.	Standard mark scheme
Q23	2 cm grid.	Standard mark scheme

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