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Mark Scheme (Results)

Summer 2012

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	150÷3 OR 3,6,9,12,15,(…)	50	2	M1 for 150÷3 or at least the first 5 multiples of 3 which may come from addition or subtraction A1 cao
	(b)		7	2	M1 for 150÷20 or 7.5 seen or multiples of 20 up to 140 or up to 160 or subtracting 20s down to 10 or −10 A1 cao
	(c)	3×20 = 60 150 ÷ 60 **OR** 20,40,60,80,100,120,140 3, 6, …, 60, …, 120, …	2	2	M1 for 20×3 or 60 seen or 150÷60 oe A1 cao **OR** M1 for listing 20 times table with 60 or 120 identified or listing 3 times table with 60 or 120 or 180 identified A1 cao (SC B1 for 2.5)
2	(a)		Point at (76, 92)	1	B1 point plotted ±0.5 small square
	(b)		Relationship described	1	B1 Description of dynamic relationship ie the greater the score in test A the greater the score in test B or positive correlation B0 If contradiction is made
	(c)		Line of best fit	2	M1 for an appropriate line of best fit or a vertical line drawn at 65 or a point plotted at (65, answer) A1 for an answer in the range 60-70 inclusive

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*3		$p + 2p + 2p - 3 = 17$ $5p - 3 = 17$ $5p = 20$ $p = 4$, so 4, 8, 5	4, 8, 5	5	M1 for $2p$ or $2p-3$ seen M1 for p +'$2p$' + '$2p - 3$' M1 for p +'$2p$' + '$2p - 3$' = 17 A1 for 4 or 8 or 5 C1 for Alan 4,Ben 8 and Clara 5 oe **OR** M1 for choosing a value for p M1 for attempting a trial M1 for attempting at least 2 trials with totals A1 for 4 or 8 or 5 C1 for Alan 4,Ben 8 and Clara 5 oe
4	(a)		(Bindings) 90 102	2	B2 for (£)90 and (£)102 (B1 for one correct entry)
	(b)		= C2–B2 = B2+B3+B4+B5+B6	3	B1 for (=) C2–B2 oe B1 for (=) B2+B3+B4+B5+B6 or (=)SUM(B2:B6) oe or intention to add correct cells is clear B1 for using correct spread sheet notation in both cases condone missing =
	(c)	10÷45x100	22.2	2	M1 10÷45×100 A1 22.2 oe
5			250 500 437.5 100 125	3	M1 for identifying the scale factor eg 10÷4 can be implied by one correct answer A1 for three correct A1 for all correct

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		3×12+9×15+15×8+21×3+27×2	10.2	4	M1 for finding at least 4 products *ft* consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints M1 (dep on 1st M) for 'Σft'÷40 A1 cao
*7		Some area examples ½x12x25=150 8x25=200 ½x11x25=137.5 5x25=125 ½x21x25=262.5 ½x44x25=550 ½x70x25=875 40x25=1000	550 ft^2	4	M1 Using the correct dimensions to calculate an area M1Complete method to find the area of the grass A1 cao C1dep on a previous M mark correct units communicated
8	(a)		0	1	B1 cao
	(b)		£30 000	3	M1 for 400 000–325 000 or 75 000 seen M1 (dep) for 0.4×'(400 000–325 000)' A1for (£) 30 000

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*9		<table><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>l</td><td>38</td><td>40.5−40.95</td><td>38.8−40</td></tr><tr><td>g</td><td>8.35−8.44</td><td>9</td><td>8.75</td></tr><tr><td>p</td><td>66.5−68.4</td><td>72</td><td>70</td></tr></table>	A,C,B	4	(litres) M1 for 9×4.5 (=40.5) or 70÷1.75 (=40) M1 for 9×4.5 (=40.5) and 70÷1.75 (=40) A1 for 40.5−40.95 and 38.8−40 **OR** (galls) M1 for 38÷4.5 (=8.4 or better) or 70÷8 (=8.75) M1 for 38÷4.5 (=8.4 or better) and 70÷8 (=8.75) A1 for 8.35−8.44 and 8.75 **OR** (pints) M1 for 38×1.75 (=66.5) or 9×8 (=72) M1 for 38×1.75 (=66.5) and 9×8 (=72) A1 for 66.5−68.4 and 72 C1 (dep on M1) for correct order identified with quantities, ie A,C,B or B, C, A **or** ft correct order from their quantities
10	(a)		150	1	B1 cao
	(b)(i)	$2(5x+1)+4(6x-2)=11$ $34x-6=11$ $34x=17$	0.5	6	M1 $2(5x+1)$ oe or $4(6x-2)$ oe seen M1 for forming an equation '$2(5x+1)$'+' $4(6x-2)$'$=11$ M1 Intention to rearrange at least one term A1 oe (Units can be ignored)
	(ii)	$6\times0.5-2$	1		M1 '0.5' substituted into correct expression A1 ft

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		No time period of how long a visit is Non-exhaustive responses Overlapping boxes/subject to interpretation	2	B2 for TWO aspects from No time period for length of visit Non-exhaustive responses Overlapping boxes ie no number quantities/open to interpretation B1 ONE correct aspect
	(b)		Question including time period and proper response boxes	2	B1 for a question about payment with a time frame for length of use B1 for at least 3 correctly labelled response boxes non-overlapping which may not be exhaustive OR for an exhaustive list of 3 or more options which could overlap
12	(a)		20	1	B1 cao
	(b)	24–19	5	2	M1 'UQ'–'LQ' A1 answer in range 3–7
	(c)	15,17,18,22,30	Box plot drawn	3	B3 for fully correct box plot (B2 for 3 correctly plotted values including box and tails) (B1 for 2 correctly plotted values including box or tails or 5 correct values plotted and no box or tails)
	(d)		Comments on range, inter quartile range, skew or median acceptable	2	B2 two relevant comparisons one spread (IQR or range) and one about the median (average is acceptable in place of the word median) B1 one comparison made

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13		85%=765 765÷85×100	900	3	M1 for (100–15)%=765 M1 (dep) 765÷'85'×100 oe A1 cao
14	(a)	(180–2x)÷ 2=90–x (180–x) ÷2–(90–x)	$y = \frac{x}{2}$	3	Use of Isosceles triangle M1 (180–2x) ÷2 or 90–x or (180–x)÷2 or 90 – $\frac{x}{2}$oe seen M1 a correct unsimplified equation in y eg y=(90-$\frac{x}{2}$)-(90-x) A1 cao OR for left hand side of triangle and angles in a triangle are 180˚ M1 angles $\frac{x}{2}$ and 180-x indicated on diagram or using angle notation M1 a correct unsimplified equation in y *eg* 180=$\frac{x}{2}$+180-x+y A1 cao OR for angles in a quadrilateral M1 angle 360-2x labelled AND used in the solution M1 a correct unsimplified equation in y eg 360=360-2x+x+2y A1 cao
	(b)	x–180=2x 3x=180	60	3	M1 Correct equation set up in x or y or combination of x and y eg 180=2x+$\frac{x}{2}$+$\frac{x}{2}$ or 180=4y+y+y or 180=x+4y M1 3x=180 or 6y=180 AND y=$\frac{x}{2}$ A1 cao

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15		$30x+4y=46$ (×2) $24x+8y=45.20$ (×0.5) Eg $60x+8y=92$ $24x+8y=45.20$ $36x=46.8$ $x = \frac{46.8}{36}$ Eg $30x+4y=46$ $12x+4y=22.60$ $18x=23.4$ $x = \frac{23.4}{18}$ **OR** Eliminates x first Or substitution back into any correct equation	Petrol £1.30 Oil £1.75	5	B1 for correct equations expressed in terms of two variables (oe) M1 for correct process to eliminate either variable (condone one arithmetic error) A1 for either x = £1.30 or £1.75 oe M1 (dep on 1st M1) for correct substitution of their found variable **OR** M1 (indep of 1st M1 for a correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both x =£1.30 and £1.75 oe SC B1 for x = £1.30 B1 for y= £1.75 oe if M0 scored

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$5000x1.028^4$	5583.96	3	M1 1+ 0.028oe or 5000x0.028 M1 $5000x1.028^4$ oe or a complete method for compound interest year on year A1 cao
	(b)(i)	12000×1.02×1.035×1.05	£13301.82	5	M1 12000 × 1.02 × 1.035 × 1.05 oe or a complete method not using a multiplier A1 cao
	(ii)	3.492753115	3.49		M1 $\frac{13301.82}{12000}$ or 1.108485 M1 $(\sqrt[3]{\frac{13301.82}{12000}}-1) \times 100$ A1 cao Or M1 1.02×1.035×1.05 or 1.108485 seen M1 ($\sqrt[3]{1.02 \times 1.035 \times 1.05}$ -1)x100 A1 cao
17		$\sqrt[3]{2}$	1.26	2	M1 Volume scale factor 2 indicated A1 $\sqrt[3]{2}$ oe

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		$x+y\leq 500$ $x\leq 300$ $y\leq 350$	3	B1 $x+y\leq 500$ B1 $x\leq 300$ B1 $y\leq 350$ If zero scored SC B1 for $x+y$? 500 and x ? 300 and y ? 350 where ? is any inequality
	(b)		Inequalities drawn and shaded	3	M1 for one of their lines drawn M1for their other two lines drawn A1 for indicating a combined region all shading consistent NB: line segments should be drawn between x=0 and x=500: for A1 shading must be consistently in or out
	(c)	(0,350) (300,0) (150,350) (300,200)	£650	4	M1 for stating 2 or more points of intersection M1 (dep) for finding 1.5x+y for a point of intersection M1 (dep on M2) for stating the maximum of their values A1 cao SC: B2 for £650 when no method marks can be awarded
19	(a)	20 small sq=1	Height 18,4	2	B2 for 2 correct histogram bars ±2mm; heights at 3 and 1.2 (B1 1 correct bar)
	(b)		8,9	2	M1 for frequency = fd × column width, implied by 1 frequency correct **or** fd correctly marked on vertical axis 0.8cm to 2 **OR** identifying 20 small sq=1 A1 8 and 9 both correct

5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		40÷247×280	45	2	M1 40÷247×280 OR 280÷(247÷40) oe OR (247÷780)y=40, y=126.315 and 280÷780x126.315 oe A1 45

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