Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics (2AM01)
Higher 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 QWC is 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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 cancelling 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		$30\,000 \div 6 = 5000$ $5000 \div 4 \times 3 =$ Or $\dfrac{1}{6} \times \dfrac{3}{4} = \dfrac{1}{8}$ $30\,000 \div 8$	3750	3	M1 for $30\,000 \div 6$ (=5000) M1 for '5000' $\div 4 \times 3$ oe A1 cao Or M1 $\dfrac{1}{6} \times \dfrac{3}{4} \left(= \dfrac{1}{8} \right)$ M1 for $30\,000 \div 8$ oe A1 cao

Question		Working	Answer	Mark	Notes
2		$\dfrac{130}{100} \times 340 = 442$ or $\dfrac{30}{100} \times 340 = 102$ $340 + 102 = 442$ Or $\dfrac{30}{100} \times 340 = 102$ $450 - 102 = 348$	£442 Or £348 Or 32(.35)%	3	M1 for $\dfrac{100 + 30}{100}$ oe M1 for $\dfrac{130}{100} \times 340$ oe (=442) A1 442 Or M1 $\dfrac{30}{100} \times 340$ (=102) oe M1(dep) $340 + 102$ (=442) A1 442 Or M1 $\dfrac{30}{100} \times 340$ (=102) oe M1 (dep) $450 - 102$ (=348) or $450 - 340$ (=110) A1 348 or 102 and 110 **Alternative method** M1 $\dfrac{450}{340}$ or $\dfrac{110}{340}$ M1 $\dfrac{450}{340} \times 100$ (= 132.35) or $\dfrac{110}{340} \times 100$ (= 32.35) A1 32(.35)

Question		Working	Answer	Mark	Notes
3	(a)	$x + 2x + 2x + 4$	$5x + 4$	2	M1 for at least 2 terms out of x, $2x$, $2x + 4$ added A1 $5x + 4$ SC B1 for answer of $2x + 4$ if M0 scored
	(b)	$x = 6$ $5x + 4 = 5 \times 6 + 4$ Or $6 + 12 + 12 + 4$	34	3	B1 $x = 6$ M1 ft on (a) for substituting 6 into their expression(s), A1 34 cao or B1 for 6 M1 for $6 + 12 + 12 + 4$ A1 34 cao
4	(a)	$100 \times 0.12 = 12$ $100 - 12 + 6.40$	94.40	2	M1 100×0.12 (=12) A1 94.4(0)
	(b)	$45.60 - 6.40$	39.20	1	B1 cao
	(c)		New decision box with 80 replaced by 70	2	B1 New decision box with correct shape B1 80 replaced by 70
5	(a)		Frequency polygon	2	**B2** Complete polygon (ignore histograms and any lines below an age of 20 or above a age of 54), but only award **B1** if there is a line joining the first to the last point. (**B1** One vertical or horizontal plotting error **OR** incorrect but consistent error in placing the midpoints horizontally **OR** correct plotting but not joined or joined with a curve).
	(b)		30 - 34	1	B1 cao
	* (c)		2 correct comments	2	C1 ft on average the women are younger C1 the range of the women is larger

Question		Working	Answer	Mark	Notes
*6		Area = $15 \times 10 = 150$ $150 \div 20 = 7.5$ 7.5 litres requires 4 pots. 4×32.40 Or Area = $15 \times 10 = 150$ $20 \times 2 = 40$ $150 \div 40 = 3.75$ 3.75 pots used requires 4 pots bought 4×32.40	£129.60	5	M1 for 15×10 (=150) M1 for '150' $\div$ 20 M1 for '7.5' $\div$ 2 (=3.75) M1 for '4' $\times$ 32.40 C1 (dep on M1) £129.60 Or M1 for 15×10 (=150) M1 for 20×2 (= 40) M1 for '150' $\div$ '40' (=3.75) M1 for '4' $\times$ 32.40 C1 (dep on M1) £129.60 Or M1 for 2m by 10m M1 for $15 \div 2$ M1 for '7.5' $\div$ 2 (=3.75) M1 for '4' $\times$ 32.40 C1 (dep on M1) £129.60
7			 0 | 0 8 9 1 | 2 2 2 3 5 6 6 2 | 0 4 8 8 3 | 1 Key 3|1 = 31 points	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors) B1 for a correct key eg 3 | 1 = 31 points (points not required)
8	(a)		Correct point plotted	1	B1 cao
	(b)		LOBF drawn	1	B1 for line of best fit drawn
	(c)		Answer in range 120 – 140	1	B1 answer in range 120 – 140
	(d)	$200 \div 4 = 50$	12.5	2	M1 $200 \div 4$ (=50) A1 answer in range 10 - 15

Question		Working	Answer	Mark	Notes
9	(a)	Opp angle = 66 180 - 66 = 114 114 ÷ 2 = 57	57	3	B1 opp angle = 66 M1 (180 - 66) ÷2 A1 cao
	(b)	98 ÷ 7 = 14 14 × 10	140	2	M1 for 98 ÷ 7 or 14 or 7 ÷ 98 oe A1 cao
	(c)	$14^2 = 196$ 20 × 196 =	3920	2	M1 $20 \times {}'14'^2$ oe A1 cao
10			=B2*20/100 7.50 =B2+C2+D2	4	B1 for (=) B2*20/100 oe B1 for 7.5(0) B1 for (=) B2 + C2 + D2 or (=) SUM(B2:D2) oe or (=) B2 + 7.5(0) + C2 or intention to add correct cells is clear B1 for using correct spreadsheet notation in both cases, condone missing =
11		a = cost(p) of an apple p = cost(p) of a pear $3a + 4p = 184$ $5a + 2p = 176$ $7a = 2 \times 176 - 184 = 168$	24, 28	4	B1 $3a + 4p = 184$ and $5a + 2p = 176$ oe M1 correct process to eliminate a or p M1(dep on M1) Substitute found value of a or p to find other variable A1 cao
12	(a)	25×10^{-9}	2.5×10^{-8}	2	M1 25×10^{-9} A1 cao
	(b)	$2.365 \times 10^{22} \div (9.46 \times 10^{15})$	2500000	2	M1 $2.365 \times 10^{22} \div (9.46 \times 10^{15})$ or 2.5×10^n or digits 25.... A1 2500000

Question		Working	Answer	Mark	Notes
13		$4x + x + 4x + x < 2x + x + 5 + 2x + x + 5$ $10x < 6x + 10$ Or $4x + x < 2x + x + 5$ $5x < 3x + 5$	$0 < x < 2.5$	5	B1 for $2x$ and $x + 5$ M1 $4x + x + 4x + x$ or $2x + x + 5 + 2x + x + 5$ oe M1 $4x + x + 4x + x < 2x + x + 5 + 2x + x + 5$ oe M1 $10x < 6x + 10$ oe A1 $(0 <) x < 2.5$ oe Or B1 for $2x$ and $x + 5$ M1 $4x + x$ or $2x + x + 5$ oe M1 $4x + x < 2x + x + 5$ oe M1 $5x < 3x + 5$ oe A1 $(0 <) x < 2.5$ oe

Question		Working	Answer	Mark	Notes
14	(a)	14, 46, 65, 78, 85, 90	Correct CF table	1	B1 cao
	(b)		Correct CF diagram	2	M1 ft from their table for at least 5 points plotted correctly at the ends of the intervals provided table values are cumulative, condoning one arithmetic error Or if the shape of the graph is correct for 5 or 6 points plotted not at the ends but consistently within each interval and joined A1 cao for correct graph with points joined by curve or straight line segments
	(c)	$90 \times 0.8 = 72$ At CF = 72, wage is £710 or At wage 685, cf = 70 $\dfrac{20}{90} \times 100 = 22\%$	Correct conclusion	4	M1 for 90×0.8 (=72) M1 for using CF to find estimate of wage A1 ft C1(dep on M1) suitable comment e.g. more than £685 Or M1 for using wage to find estimate of CF M1 for $\dfrac{'20'}{90} \times 100$ (=22.2) or $\dfrac{'70'}{90} \times 100$ (=77.8) A1 ft C1(dep on M1) suitable comment based on their evidence e.g. less than 80%

Question		Working	Answer	Mark	Notes
15	(a)		2^9	1	B1 cao
	(b)		2^0	1	B1 cao
	(c)	$2^9 \div 8 = 2^9 \div 2^3$	2^6	2	M1 $2^{'9'} \div 2^3$ or 64 A1 ft 'a'
16		$6000 \times (1+0.035)^4 =$ $6000 \times 1.1475... = 6885.13..$ $6885.13 - 6000$ OR $6000 \times 1.035 = 6210$ $6210 \times 1.035 = 6427.35$ $6427.35 \times 1.035 = 6652.30725$ $6652.30725 \times 1.035 =$ $6885.13..$ $6885.13 - 6000$	885.13	4	M2 $6000 \times (1+0.035)^4$ or 6000×1.035^4 A1 6885.13 - 6885.14 A1 for 885.13 - 885.14 OR M1 6000×1.035 oe (= 6210) Or 6000×0.035 oe (=210) M1 (dep) '6210' $\times 1.035$ and '6427.35' $\times 1.035$ and '6652.30725' $\times 1.035$ A1 6885.13 - 6885.14 A1 for 885.13 - 885.14

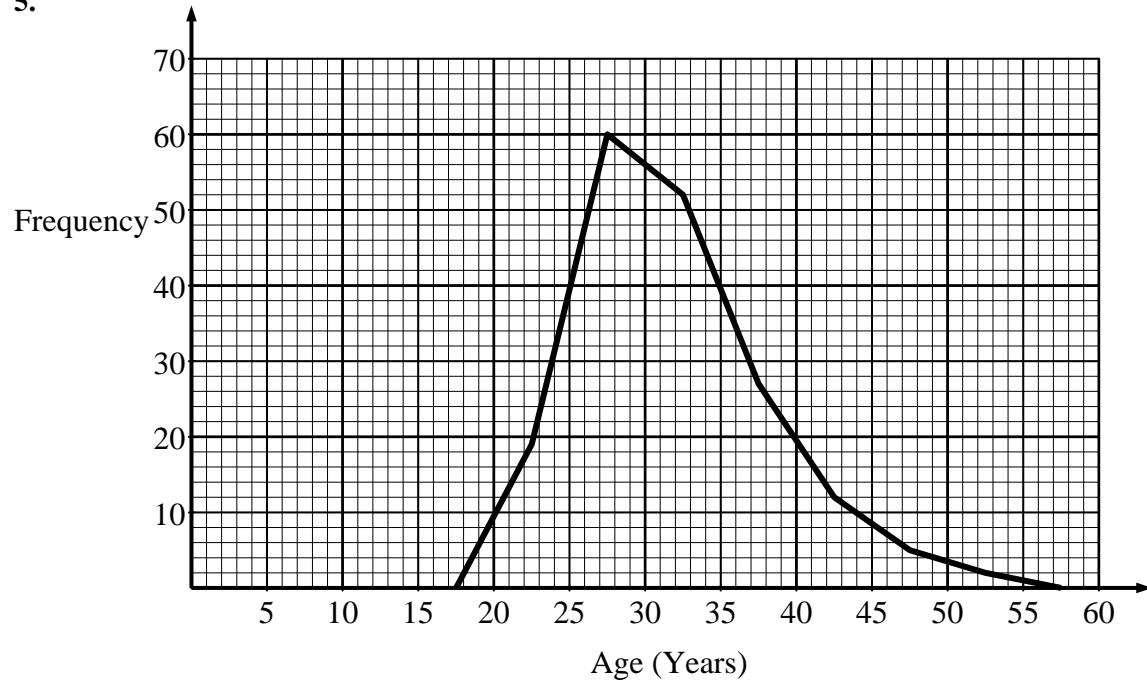| Question		Working	Answer	Mark	Notes
17	(a)		(4, 3, 0)	1	B1 cao
	(b)	$\dfrac{5+4}{2},\dfrac{0+3}{2},\dfrac{0+6}{2}$	(4.5, 1.5, 3)	2	M1 $\dfrac{5+4}{2},\dfrac{0+3}{2},\dfrac{0+6}{2}$ oe A1 cao
18	(a)		Suitable comment	1	B1 e.g. Stratified is better because there are a lot more woman than men in the population.
	(b)	$\dfrac{69}{105+204}\times 60$	13	2	M1 $\dfrac{69}{309}\times 60$ (= 13.398) or $\dfrac{69}{309}\times 100$ and $\dfrac{'22.3'}{100}\times 60$ A1 13
19	(a)		$y \geq 200$ $3x + 4y \leq 2100$	3	B1 cao B2 $3x + 4y \leq 2100$ oe in least terms (B1 for $90x + 120y \leq 63000$) oe
	(b)		Correct feasible region	3	B1 At least 1 correct line drawn B1 All lines drawn ft candidate's answers to (a) B1 fully correct region identified unambiguously
	(c)	Corners <table><tr><td>x</td><td>y</td><td>P</td></tr><tr><td>100</td><td>200</td><td>1600</td></tr><tr><td>100</td><td>450</td><td>2600</td></tr><tr><td>300</td><td>300</td><td>3600</td></tr><tr><td>366</td><td>200</td><td>3728</td></tr></table>	3728	2	M1 for tests $8x + 4y$ at at least 2 corners or draws $8x + 4y = P$ (any P) A1 3728

Question	Working	Answer	Mark	Notes
20	$BD = 3b$ Area $ACE = \dfrac{1}{2} \times 2b \times 4b = 4b^2$ Area $ABCDE =$ $\dfrac{1}{2} \times 3b \times 0.6b + \dfrac{1}{2}(3b + 4b) \times 1.4b$ $= 0.9b^2 + 4.9b^2 = 5.8b^2$ Area $= \left(5.8b^2 - 4b^2\right)$	$1.8b^2$	5	B1 $BD = 3b$ M1 Area $ACE = \dfrac{1}{2} \times 2b \times 4b$ $(= 4b^2)$ M1 Area $ABCDE = \dfrac{1}{2} \times '3b' \times 0.6b$ $(=0.9b^2)$ $+ \dfrac{1}{2}('3b' + 4b) \times 1.4b$ $(=4.9b^2)$ M1 (dep on M1) $\left('5.8'b^2 - '4'b^2\right)$ A1 $1.8b^2$ oe

Question		Working	Answer	Mark	Notes
21		US 1 gal costs 20.88÷6=$3.48 1 litre costs $3.48÷3.79 = $0.918... I litre costs 0.918..× 0.77 Euros = 0.707..Euros Russia 1 litre costs 800 ÷25.58 = 31.27... Roubles 1 litre costs 31.27÷40.63 Euros = 0.769... Euros Or 25.58 litres = 25.58 ÷ 3.79 = 6.749.. US gallons 800 roubles = (800÷40.63)÷0.77 = $25.571.. Cost in $ of 1 US gallon in Russia is 25.571..÷6.749... = $3.788.. Cost in $ of 1 US gallon in US = 20.88÷6 = $3.48 Cost per litre for US petrol $0.918 or €0.707 or 28.7 rub Cost per gallon for US petrol $3.48 or €2.68 or 109 rub Cost per litre for Russian petrol 31.27 rub or €0.770 or $1 Cost per gallon for Russian petrol 118 rub or €2.92 or $3.79	Correct conclusion based on correct calculations	5	M1 for a conversion, gallons to litres or litres to gallons M1 for a conversion, roubles to US Dollars or US Dollars to roubles or convert both to Euros M1 for a conversion to common units and common currency A1 for two correct answers in the same currency and for the same unit C1 (dep on at least M1) for correct conclusion ft candidate's figures. eg M1 1 US gal costs 20.88÷6 (=3.48) M1 1 litre costs 3.48 ÷3.79 ..× 0.77 (=0.707..) M1 1 litre in Russia costs 800 ÷25.58 ÷40.63 (=0.769) A1 for 0.707 and 0.769 C1 (dep on at least M1) for correct conclusion ft candidate's figures.

PAPER: 5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		FDs .13 .6 .76 .44 .19 .03	Correct histogram	3	B1 at least one correct FD B1 at least two correct FD B1 completely correct histogram Or B1 key B1 at least two columns of different width correct B1 completely correct histogram

5.

Frequency (y-axis): 10, 20, 30, 40, 50, 60, 70

Age (Years) (x-axis): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60

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: ±5°
Measurements of length: ±5 mm

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q4	(c)	In the space below, or on the diagram, show … "on the diagram" is inserted	
Q5		Table – some frequencies changed 0, 20, 60, 55, 25, 10, 5, 2, 0 Graph – both axes 1½ cm for 5. Difficulty with accuracy for midpoints Q version x axis labelled only in 10's	
Q7		4 lines not 3 in the stem and leaf diagram. Key put at the top	
Q8		Scatter graph – x axis 3 cm for 10 with an intermediate line, y axis 3 cm for 20 with an intermediate line	
Q9	(a)	Size 2	
	(b)	Size ✖ 2. Flag – the rhombus has dotty shading but the rest is unshaded	
	(c)	Size ✖ 2. Flag – the rhombus has dotty shading but the rest is unshaded	

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q14		Frequency table – values changed 10, 30, 20, 15, 10, 5. This will alter the cumulative frequency table	
	(b)(c)	Grid – x axis – 1½ cm for 100, y axis – 3 cm for 10 with an intermediate line	
Q17		Model provided as well as diagram. Model on a base	
Q19		2 cm for 100 on both axes	
Q20		Diagram 2, b changed to x	
Q22		Frequencies changed 15, 30, 40, 45, 20, 15 Grid x axis 2 cm for 100, y axis 4 cm with intermediate (8 ✕ 4 cm)	