Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Methods in Mathematics
Higher: (Non-Calculator) Unit 1

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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.

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. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should 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 award marks for the quality of written communication (QWC).
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.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.

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.

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.

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 (embedded answers).

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)

14   The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme

M1 – method mark for appropriate method in the context of the question
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

Question		Working	Answer	Mark	Notes
1	(a)	245　　　10 × 245 = 2450 　18 ×　　8 × 245 = 1960 1960　　　　　　4410 2450 4410 (grid method table) | 2	4	5	×
0/2	0/4	0/5	1
1/6	3/2	4/0	8
4	4	1	0 | |	200	40	5
10	2000	400	50
8	1600	320	40 | 2000 + 1600 + 400 + 320 + 50 + 40 = 4410 24.5 × 2 = 49 24.5 × 0.2 = 4.9 49 – 4.9	44.1	3	M1 for a complete method for multiplying 245 by 8 and 10; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **OR** M1 for a complete method for multiplying 2, 4 and 5 by 1 and 8; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **OR** M1 for a complete method for multiplying 200, 40 and 5 by 8 and 10; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **OR** M1 for a complete method for multiplying 20, 4 and 0.5 by 1 and 0.8; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **OR** M1 for a complete method for multiplying 24.5 by 2 and 0.2; condone one error in multiplication M1 (dep) for subtraction; condone one subtraction error A1 cao

Question		Working	Answer	Mark	Notes
1	(b)	$\begin{array}{r} 38.4 \\ 12\overline{\smash{\big)}\,460.8} \\ 36 \\ \hline 100 \\ 96 \\ \hline 48 \end{array}$ $1.2 \times 10 = 12$ $1.2 \times 10 = 12$ $\underline{1.2 \times 10 = 12}$ $1.2 \times 30 = 36$ $46.08 - 36 = 10.08$ $1.2 \times 9 = 10.8$ $1.2 \times 8 = 9.6$ $10.08 - 9.6 = 0.48$ $0.48 = 1.2 \times 0.4$ $30 + 8 + 0.4$	38.4	3	M1 for intention to divide 46.08 or 460.8 or 4608 by 12 or 120 M1 for a fully correct method A1 for 38.4 **OR** M1 for an attempt at a build-up method (eg. $1.2 \times 10 = 12$ seen) M1 for a complete method to build-up to 46.08 A1 for 38.4

Question		Working	Answer	Mark	Notes
2	(i)		436.8	2	B1 cao
	(ii)		452.4		B1 cao
*3			Angle APQ = 56°	5	M1 for $180 - 90 - 22$ (= 68) M1 $(180 - 68) \div 2$ (= 56) A1 for angle APQ = 56 C2 (dep on M2) for "sum of the <u>angles</u> in a <u>triangle</u> is <u>180°</u>" oe and "base <u>angles</u> of an <u>isosceles</u> triangle are <u>equal</u>" oe (C1 (dep on M1) for one correct reason in the correct context) **OR** M1 for $360 - 22 - 90$ (= 248) M1 for $(360 - "248") \div 2$ (=56) A1 for angle APQ = 56 C2 (dep on M2) for "sum of the <u>angles</u> in an <u>quadrilateral</u> is <u>360°</u>" and "base <u>angles</u> of an <u>isosceles</u> triangle are <u>equal</u>" and "sum of the <u>angles</u> on a <u>straight line</u> is <u>180°</u>" oe (C1 (dep on M1) for one correct reason in the correct context)

Question		Working	Answer	Mark	Notes
4	(i)	$\times$ 2 3 4 1 2 3 4 2 4 6 8 3 6 9 12	$\frac{1}{9}$	3	M1 for identifying 3×4 (= 12) M1 for 9 seen or 9 outcomes or a sample space with 9 possibilities or a list of 9 ordered pairs A1 for $\frac{1}{9}$ oe **OR** M1 for identifying 3×4 (= 12) M1 for $\frac{1}{3} \times \frac{1}{3}$ A1 for $\frac{1}{9}$ oe
	(ii)	$\times$ 2 3 4 1 **2** **3** **4** 2 **4** **6** 8 3 **6** 9 12	$\frac{6}{9}$	2	M1 for identifying 5 or 6 combinations under 8 (condone inclusion of 8) A1 for $\frac{6}{9}$ oe **OR** M1 for identifying the 3 combinations 8 and over and using $1 - \frac{3}{9}$ A1 for $\frac{6}{9}$ oe

Question		Working	Answer	Mark	Notes
5	(a)			4	M1 for two intersecting circles with 6 labeled in the intersection M1 for 21 – 6 (=15) or 10 – 6 (=4) M1 for 30 – "15" – 6 – "4" (=5) A1 for a fully correct and labeled Venn diagram; condone a missing outer rectangle
	(b)		$\dfrac{4}{30}$	2	M1 (ft from (a)) for $\dfrac{"4"}{a}$, $a > "4"$ or $\dfrac{b}{30}$, $b < 30$ with $b \neq 0$ A1 for $\dfrac{4}{30}$ oe
6	(a)		m^4	1	B1 cao
	(b)		p^6	1	B1 cao
	(c)		$28x^5y^3$	2	M1 for 2 of 28, $x^{2+3} (= x^5)$, $y^{1+2} (= y^3)$ A1 for $28x^5y^3$
	(d)		$8x - y$	2	M1 for $3x – 6y$ or $5x + 5y$ A1 for $8x – y$ or $–y + 8x$ (accept $8x – 1y$)

Question	Working	Answer	Mark	Notes
7		7	4	M1 for $1 - 0.4 - 0.3 - 0.16$ or $100 - 40 - 30 - 16$ A1 for 0.14 oe M1 for "0.14" $\times$ 50 oe A1 for 7 or ft "0.14" $\times$ 50 **OR** M1 for $0.4 \times 50 \ (= 20)$ or $0.3 \times 50 \ (= 15)$ or $0.16 \times 50 \ (= 8)$ A1 for 20 and 15 and 8 M1 for 50 – "20" – "15" – "8" A1 for 7 or ft from "20", "15" or "8"
8		77 cm^2	5	M1 for a method to find the area of any triangle that could be used to find the total area M1 for a method to find the area of any other shape, eg. trapezium or rectangle, that could be used to find the total area M1 for a fully correct method to find the total area A1 for 77 B1 (indep) for cm^2

Question		Working	Answer	Mark	Notes
*9			Proof	4	M1 for setting up a correct equation in x, eg. $3x - 2 = x + 1$ M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for ("1.5" + 1) × 4 or (3 × "1.5" − 2) × 4 or (3 × "1.5" − 2) × 2 + ("1.5"+ 1) × 2 C1 (dep on M3) for completing the proof resulting in a perimeter of 10 **OR** M1 for setting up a correct equation in x, eg. $2(3x - 2) + 2(x + 1) = 10$ M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for "1.5" + 1 and 3 × "1.5" − 2 C1 (dep on M3) for completing the proof resulting in a justification that the shape is a square
10	(a)		(6, 0, 5)	1	B1 cao
	(b)	$\frac{6+0}{2}, \frac{4+0}{2}, \frac{0+5}{2}$	(3, 2, 2.5)	2	M1 for a correct method to find the midpoint or (a, 2, 2.5) or (3, b, 2.5) or (3, 2, c) A1 cao

PAPER: 5MM1H_01				
Question	Working	Answer	Mark	Notes
*11		$y = 2x – 1$ has the greater gradient	4	M1 for plotting at least 2 unambiguous correct points satisfying $y = 2x – 1$; ignore any incorrect points M1 for correct points plotted with no incorrect points A1 for a single straight line segment of $y = 2x – 1$ C1 (dep on M1) for "$y = 2x – 1$ has the greater gradient" or ft their single line **(Alternative method)** M1 for a correct method to find gradient of **L** A1 for gradient of 1.5 M1 for gradient of $y = 2x – 1$ is 2 C1 (dep on M1) for "$y = 2x – 1$ has the greater gradient" oe or ft their gradients [SC: B1 for a single line segment drawn of gradient 2 if M0 scored]
12		Rotation of 180º about (0, –1) **OR** Enlargement, scale factor –1 about (0, –1)	3	B1 for a rotation B1 for an angle of 180º B1 for centre the point (0, –1) [SC: If no marks scored, award B1 for a correct reflection C drawn] **OR** B1 for a enlargement B1 for a scale factor of –1 B1 for centre the point (0, –1) [SC: If no marks scored, award B1 for a correct reflection C drawn]

Question		Working	Answer	Mark	Notes
13	(a)		$\dfrac{4}{11}$	2	M1 for $\dfrac{4}{q}$ where q > 4 or for $\dfrac{p}{11}$ where $p < 11$ A1 cao
	(b)		$\dfrac{2}{11}$	2	M1 for intersection with 2 letters or {a, g} A1 for $\dfrac{2}{11}$ oe
	(c)		$\dfrac{4}{11}$	1	B1 for $\dfrac{4}{11}$ oe
14	(a)		2.5×10^5	1	B1 cao
	(b)		0.0359	1	B1 cao
	(c)		2.13×10^4	2	M1 for 15000 + 6300 (= 21300) oe or $1.5 \times 10^4 + 0.63 \times 10^4$ oe or 2.13×10^n where $n > 0$ A1 cao
15			6	2	M1 for $15 \div 10$ (= 1.5) or $10 \div 15$ (= 0.66..) or $\dfrac{10}{15}$ or $\dfrac{15}{10}$ seen A1 cao

Question		Working	Answer	Mark	Notes
16	(a)		$5(1-4x)(1+4x)$	2	M1 for $5(1-16x^2)$ or $5(1\pm4x)(1\pm4x)$ A1 for $5(1-4x)(1+4x)$ or $5(1+4x)(1-4x)$
	(b)		$6x^2 - 23xy + 20y^2$	2	M1 for any 3 of: $6x^2$, $-8xy$, $-15xy$, $20y^2$ or $6x^2$ and $8xy$ and $15xy$ and $20y^2$, ignoring signs A1 for $6x^2 - 23xy + 20y$
17	(a)		3	1	B1 for 3 (accept ±3, but not -3 alone)
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ $(= 0.5)$
	(c)		4	1	B1 cao
	(d)		6	3	M1 for using $8 = 2^3$ M1 for deriving a correct equation in m A1 cao
18			$\frac{3}{8}$	4	M1 for $3(2x-3) + 2(x+6)$ $(= 6)$ or $\frac{3(2x-3)+2(x+6)}{6}$ $(=1)$ M1 for a correct method to get $6x - 9 + 2x + 12 = 6$ M1 (dep on M2) for a correct method to isolate terms in x A1 for $\frac{3}{8}$ oe

Question		Working	Answer	Mark	Notes
19	(a)		0.3 0.7, 0.3, 0.7, 0.3	2	B1 for 0.3 for the 1st match B1 for fully correct probs. for the 2nd match
	(b)		0.49	2	M1 for 0.7 × "0.7" A1 for 0.49 ft their diagram
	(c)		0.51	2	M1 for 1 – "0.49" A1 ft for 0.51 **OR** M1 for 0.7 × "0.3" + "0.3" × "0.7" + "0.3" × "0.3" A1 for 0.51 or ft their tree diagram provided all probabilities are less than 1
20			$x = 4,\ x = 0$	4	M1 for $x^2 - 2x + 1 - 2x + 2 - 3 = 0$; condone one sign error in the complete expansion M1 for $x^2 - 4x = 0$ M1 (dep on M1) for a correct method to solve their quadratic equation; eg. $x(x - 4) = 0$ A1 cao for $x = 4$ and $x = 0$ **OR** M1 for $y = x - 1$ M1 for a correct method to solve their quadratic equation; eg. $(y - 3)(y + 1) = 0$ M1 (dep on M1) for correct substitution of their two solutions eg. $x = 3 + 1$ or $-1 + 1$ A1 cao for $x = 4$ and $x = 0$

Question	Working	Answer	Mark	Notes
*21		Angle $NTP = 5^o$	5	M1 for angle $PNM = 180^o - 65^o$ $(= 115^o)$ or angle $LMP = 90^o$ M1 for "$180^o - 65^o - 90^o$" $-$ ("$180^o - 45^o - 115^o$") A1 for Angle $NTP = 5^o$ C2 (dep on M2) for "opposite angles of a cyclic quad add up to 180°" and "angles in a semicircle are equal to 90°" and "angles in a triangle sum to 180°" (C1 (dep on M1) for either "opposite angles of a cyclic quad add up to 180°" or "angles in a semicircle are equal to 90°") **OR** M1 for angle $PNT = 65^o$ or angle $LMP = 90^o$ M1 for '$180^o - 65^o - 90^o$' $+ 45^o - 65^o$ A1 for Angle $NTP = 5^o$ C2 (dep on M2) for "ext. angle of a cyclic quad is equal to int. opposite angle" and "angles in a semicircle are equal to 90°" and "angles in a triangle sum to 180" and "ext angle of a triangle is equal to the sum of the two opp int angles" (C1(dep on M1) for either "ext. angle of a cyclic quad is equal to int. opposite angle" or "angles in a semicircle are equal to 90°")

Question	Working	Answer	Mark	Notes
22	$$\dfrac{(2x-1)(x+5)}{(2x-1)(3x-1)}$$	$$\dfrac{x+5}{3x-1}$$	3	M1 for factorizing the numerator correctly M1 for factorizing the denominator correctly A1 for $\frac{x+5}{3x-1}$
23		$$\dfrac{3\mathbf{b}-\mathbf{c}}{4}$$	4	M1 for $\overrightarrow{CD}=\overrightarrow{CO}+\overrightarrow{OB}+\overrightarrow{BD}$ M1 (indep) for $\overrightarrow{CO}+\overrightarrow{OB}=-\mathbf{c}+\mathbf{b}$ or $\overrightarrow{BA}=-\mathbf{b}+3\mathbf{c}$ M1 for $-\mathbf{c}+\mathbf{b}+\frac{1}{4}(-\mathbf{b}+3\mathbf{c})$ A1 for $\frac{3\mathbf{b}-\mathbf{c}}{4}$ **OR** M1 for $\overrightarrow{CD}=\overrightarrow{CA}+\overrightarrow{AD}$ M1 (indep) for $\overrightarrow{CA}=2\mathbf{c}$ or $\overrightarrow{AB}=-3\mathbf{c}+\mathbf{b}$ M1 for $2\mathbf{c}+\frac{3}{4}(-3\mathbf{c}+\mathbf{b})$ A1 for $\frac{3\mathbf{b}-\mathbf{c}}{4}$

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**
Q04		Spinners straightened up. Spike removed.	
Q06	(c)	MLP x changed to e y changed to f	
Q06	(d)	MLP: x changed to w	
Q08		Wording added: AE = BC ED = CD EC joined with a dashed line.	
Q09		MLP: x changed to y	
Q10		Model provided for all. AB joined with a dashed line. Diagram for MLP only.	
Q11		Grid enlarged.	

PAPER: 5AM1H_01		
Question	Modification	Notes
Q12	2 cm grid. x axis stopped at 5	
Q18	MLP: x changed to y	
Q19	Diagram enlarged. MLP wording added: These are five spaces to fill. Braille roman numerals (i) to (v) put in spaces.	
Q23	Vectors larger than other print.	