Mark Scheme (Results)

Summer 2014

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 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 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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: 5AM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		Travel graph	2	M1 for horizontal line joining (10 15, 16) to (10 45, 16) or for joining their ("10 45", 16) to (12 00, 0) [Note: A single line from (10 15, 16) to (12 00, 0) gets M0] A1 cao
	(b)		12.8	2	M1 for 16 ÷ "1.25" oe A1 cao
2			Region shaded	4	B1 for bisector of angle *ABE* B1 for line drawn parallel to *AD* and 5 cm from *AD* B1 for arc of circle drawn centre *E* with radius 6 cm B1 ft for shading a region to the right of their vertical line **and** above their angle bisector **and** below their arc
3		$225 \div 175 = 1.28(57....)$ $275 \div 250 = 1.10$ $\underline{375 \div 300 = 1.25}$ $175 \div 225 = 0.7(77...)$ $250 \div 275 = 0.9(09...)$ $\underline{300 \div 375 = 0.8}$	Medium with reasons	4	M1 for a method that results in at least two values that can be used to compare at least two cups M1 for a complete method that results in values that can be used to compare the three cups A1 for all correct values that are used for comparison C1 ft (dep on M2) for comparison of their values with a correct conclusion

PAPER: 5AM2H_01					
Question		Working	Answer	Mark	Notes
4		Flour: 300 ÷ 12 = 25 3000 ÷ 25 = 120 Butter 150 ÷ 12 = 12.5 900 ÷ 12.5 = 72 Sugar 150 ÷ 12 = 12.5 1000 ÷ 12.5 = 80 Fruit 100 ÷ 12 = 8.3(33..) 800 ÷ 8.3(33..) = 96 Eggs 1÷ 12 = 0.08(33..) <u>12 ÷ 0.08(33..) = 144</u> Flour: 3000 ÷ 300 = 10 12 × 10 = 120 Butter 900 ÷ 150 = 6 12 × 6 = 72 Sugar 1000 ÷ 150 = 6.6(66..) 12 × 6.6(66..) = 80 Fruit 800 ÷ 100 = 8 12 × 8 = 96 Eggs 12÷ 1 = 12 12 × 12 = 144	72	4	M1 for a correct method to either find the amount of one ingredient required for one bun, eg. 300 ÷ 12 (= 25 g), 150 ÷ 12 (= 12.5 g), etc. or for a correct method to find the number of groups of 12 buns that are possible with the amount of one ingredient available, eg. 3000 ÷ 300 (= 10), 900 ÷ 150 (= 6), etc. M1 (dep) for a correct method for considering all ingredients in this way M1 for a fully complete and correct method leading to the number of buns that can be made from each ingredient. A1for 72 cao

PAPER: 5AM2H_01					
Question		Working	Answer	Mark	Notes
5			13	4	M1 for a correct algebraic representation showing a correct relationship between at least two ages, eg (Narinder =) x, (Rashmi =) $x + 3$ Note: $x + 3$ or $2(x + 3)$ can imply Narinder = x. M1 (dep on M1) for deriving an algebraic inequality (or equality), correct from their 3 algebraic expressions, eg. $x + x + 3 + 2(x + 3) <$ (or =) 50 M1 (dep on M2) for a complete and correct method to simplify their inequality (or equality) to for eg. $4x < 41$ ($4x = 41$) C1 (dep on previous M1) for $x < 10.25$ ($x = 10.25$) and a statement identifying Rashmi as 13 years of age, cao OR M1 for one correct trial showing total of ages under 50 M1 for one correct trial showing total of ages over 50 M1 for identifying 10, 13 and 26 as their ages with a sum of 49 years. C1 (dep on previous M1) for fully correct arithmetic and a statement identifying Rashmi as 13 years of age, cao

PAPER: 5AM2H_01					
Question		Working	Answer	Mark	Notes
6			46.20	5	M1 for 660 × 4 (= 2640) M1 for "number of points" ÷ 10 (= 264) M1 for "264" × 20p (= £52.80) M1 (dep on M2) for £99 – "£52.80" A1 for 46.2(0) OR M1 for £99 ÷ 20p (= 495) M1 for "495" × 10 (= 4950) points needed M1 for 660 ×4 (= 2640) M1 (dep on M2) for ("4950 – 2640") ÷ 10 × £0.20 A1 for 46.2(0)
7			18	3	M1 for Total claimed is 150 × 1200 (= 180 000) M1 for "180 000" ÷ 10 000 A1 cao OR M1 for writing probability of a claim as $\dfrac{150}{10000}$ M1 for "$\dfrac{150}{10000}$" × 1200 A1 cao OR M1 for 10000 ÷ 150 (= 66.66....) M1 for 1200 ÷ "66.66.." A1 cao

Question		Working	Answer	Mark	Notes
*8			25	5	M1 for a correct method to find area of trapezium, eg. ½ (0.8 + 1) × 0.6 (= 0.54m^2) Units must be consistent M1 for Vol of prism = "0.54" × 3 (= 1.62 m^3) oe M1 (dep on previous M1) for a correct method to find number of bags, eg. "1.62" × 1000 ÷ 65 oe. eg. "1620000" ÷ 1000 ÷ 65 A1 cao for 24.9(230…) C1 ft (dep on previous M1) for correct rounding up of "24.9230..."
9	(a)		$\dfrac{77}{80}$	1	B1 for $\dfrac{77}{80}$ oe, eg. 96.25% or 0.9625
	(b)		4	2	M1 for 0.05 × 80 or $\dfrac{4}{80}$ A1 for 4 oe. (eg. 4 out of 80)

Question	Working	Answer	Mark	Notes
10		45.8 to 46	5	M1 for $40 \div 16$ ($= 2.5$) or $\frac{9}{16} = (0.5625)$ or $\frac{16}{9} = (1.777..)$ M1 for "2.5" $\times 9$ ($= 22.5$) or $40 \times$ "0.5625" ($= 22.5$) or $40 \div$ "1.777..." ($= 22.5$) M1 (dep on at least M1) for $40^2 +$ "22.5"^{2} M1 for $\sqrt{1600 + 506.25}$ A1 answer in the range 45.8 to 46 OR M1 for a build up method using equivalent ratios to 16 : 9 M1 for a complete method to find the height of the television ($= 22.5$) M1 (dep on at least M1) for $40^2 + 22.5^2$ M1 for $\sqrt{1600 + 506.25}$ A1 answer in the range 45.8 to 46 OR M1 for $16^2 + 9^2$ ($=337$) M1 for $\sqrt{256 + 81}$ ($= 18.35(755975)$) M1 for $40 \div 16$ ($= 2.5$) or $16 \div 40$ ($= 0.4$) M1 for "18.35(75)" $\times$ "2.5" or "18.35(75)" $\times$ "0.4" ($=45.89(39389938)$) A1 answer in the range 45.8 to 46 [SC: M1 for $40^2 + 14.4^2$ or $40^2 + 25.6^2$ M1 for $\sqrt{1600 + 207.36}$ or $= \sqrt{1600 + 655.36}$]

PAPER: 5AM2H_01					
Question		Working	Answer	Mark	Notes
11	(a)		22.5	1	B1 for 22 - 23
	(b)		115–160	4	M1 for correct method to convert 800 gallons to litres (≈ 3600) M1 for "3600" + 2000 – 5000 (≈ 600) M1 (dep on the previous M1) for correct method to convert "600 *l*" back to gallons A1 for value in the range 115–160 OR M1 for 5000 – 2000 (≈ 3000) M1 for correct method to convert '3000*l*' to gallons (≈ 660) M1 (dep on the previous M1) for 800 – "660" A1 for value in the range 115–160 OR M1 for correct method to convert 5000 *l* (≈ 1100) **and** 2000 *l* (≈ 440) to gallons M1 for "1100"–"440" (≈ 660) M1 (dep on the previous M1) for 800 –"660" A1 for a value in the range 115–160

Question		Working	Answer	Mark	Notes
12	(a)		1.5 m	1	B1 cao
	(b)		06 54 and 11 12	2	B1 for 06 48 to 07 00 B1 for 11 06 to 11 18
	(c)		7 hr 30 min to 8 hr (7.5 to 8 hours)	1	B1 for answer in range 7 hr 30 min to 8 hr (7.5 to 8 hours) oe
13	(a)		1.80	4	M1 for £3.60 ÷ 4 (= 90p) M1 (indep) for 9.90 – 3 × "90p" = (£7.20) M1 (dep on previous M1) for "7.20" ÷ 4 A1 for 1.8(0) oe OR M1 for correctly setting up two simultaneous equations, with an attempt to eliminate c M1 for a correct method to eliminate terms in c (chips), condone one arithmetic error M1 for a correct method to solve an equation in the form $af = b$, where f = fish A1 for 1.8(0) oe
	(b)		13.50	3	M1 for recognising that $\dfrac{4}{5} = 10.80$ oe M1 for 10.80 ÷ 4 × 5 oe A1 for 13.5(0)

Question		Working	Answer	Mark	Notes
14	(a)		70.0....	3	M1 for tan (35) = $\dfrac{ht}{100}$ M1 for $100 \times \tan 35$ A1 for 70(.02...)
	(b)		6.12....	3	M1 for consistent use of units, eg. 7.5 and 0.8 or 750 and 80 or for $\sin = \dfrac{80}{7.5}$ M1 for $\sin^{-1} \dfrac{0.8}{7.5}$ oe A1 for 6.1(23198866)
15			0.7 to 0.9	3	M1 for drawing a tangent to the curve at 20 minutes M1 (dep) for $\dfrac{\text{correct vertical distance}}{\text{correct horizontal distance}}$ eg. $\dfrac{30}{37}$ A1 (dep on M1M1) for answer in range 0.7 to 0.9 (condone a negative answer)
16			19.5	4	M1 for a correct quote of Pythagoras' theorem on one triangle, eg. $4.5^2 + 6^2$ (= 56.25) M1 for a correct second step in solution, eg. $\sqrt{(20.25 + 36)}$ (= 7.5) M1 (indep) for second use of Pythagoras' theorem, eg. "7.5"$^2 + 18^2$ (= 380.25) A1 for 19.5 cao OR M2 for $4.5^2 + 6^2 + 18^2$ (=380.25) M1 for $\sqrt{(20.25 + 36 + 324)}$ A1 cao for 19.5

Question	Working	Answer	Mark	Notes
17		91	5	M1 for $\pi \times \left(\frac{30}{2}\right)^2$ (= 706.(858...)) M1 (dep) for "706.85..." $\times$ 8 (= 5654.8(667…)) M1(indep) for "5655" $\times$ 800 (= 4523893) or 50000 ÷ 800 (=62.5) M1 (dep on previous M1) for "4 523 893" ÷ 50 000 (= 90.47.....) or "5655" ÷ "62.5" (= 90.47....) A1 for 91 cao

*18	d: UB = 190.5 (190.49..)
	      LB = 189.5
	 f: UB = 25.75 (25.749..)
	      LB = 25.65
		7.4
		
		 because the LB and UB agree to that number of figures
			5	B1 for one correct bound of d
				 B1 for one correct bound of f
				
				 M1 for a correct method to find the upper bound of c,
				 eg. "190.5" ÷ "25.65" (= 7.4269....)
				 or for a correct method to find the lower bound of c,
				 eg. "189.5" ÷ "25.75" (= 7.359....)
				
				 A1 for 7.42(69…) and 7.35(92…)
				
				 C1 (dep on M1) for a statement that both LB and UB round to "7.4" to one decimal place oe
				
				 NB an answer of 7.39(2996…) or 7.4 without working or from 190 ÷ 25.7 scores no marks

Question	Working	Answer	Mark	Notes
19		144 to 147	5	B1 for $\dfrac{60}{360}$ oe seen or 0.166(666…) seen M1 for $\dfrac{60}{360} \times \pi \times 40 \times 40$ oe or sight of answer in range 837 - 839 M1 for a correct method to find the area of the triangle (= answer in the range 692 to 693) M1 (dep on M1) for the intention to find the difference between the area of triangle *OPS* and the area of sector *OPRS* A1 for answer in the range 144 to 147

20	Examples:
	$½ \times 10 \times 53$ = 265 m
	$½ \times (53 + 60) \times 10$ = 565 m
	30×60 =1800 m
	                  2630 m
	
	or
	
	$10 \times 60 \times 3$ =1800 m
	$½ \times 5 \times 34$ = 85 m
	$½ \times (34 + 53) \times 5$ = 217.5 m
	$½ \times (53 + 58) \times 5$ = 277.5 m
	$½ \times (58 + 60) \times 5$ = 295 m
	                  2675 m
		2.6 to 2.7	3	M1 for a method to find the area of a triangle or a trapezium or a rectangle between the graph and the Time axis
				M1 for a complete method to find the area of at least 3 correct shapes under the graph
				A1 for answer in range 2.6 to 2.7 km or 2600 to 2700 m

Question	Working	Answer	Mark	Notes
21		565or 566	5	M1 for using other than a linear relationship attempt to establish Month 1 population as $100 \times x$ oe. eg $100\left(1 + \frac{r}{100}\right)$ M1 for forming equation $100\,x^2 = 200$ oe. eg. $100\left(1 + \frac{r}{100}\right)^2 = 200$ M1 for method to solve equation to establish $x = \sqrt{2}$ M1 for attempting to find Month 5 population e.g. $100 \times \sqrt{2}^5$ oe A1 for 565 or 566 given as answer dependent on working seen **Or** M1 for realising that population doubles in 2 months in a non-linear relationship, eg month 4 = 400, month 6 = 800, etc. M1 for forming the equation $2 = x^2$ or $x = \sqrt{2}$ M1 for method to solve equation to establish $x = \sqrt{2}$ M1 for attempting to find Month 5 population is $100 \times \sqrt{2}^5$ A1 for 565 or 566 given as answer dependent on working seen **Or** M1 for establishing population is of form $N = Ab^t$ oe M1 for substituting $t = 0$, $N = 100$ gives $100 = Ax^0$ or $A = 100$ M1 for substituting $t = 2$, $n = 200$ gives $200 = 100x^2$ and $x^2 = 2$ so $x = \sqrt{2}$ M1 for attempting to find Month 5 population is $100 \times \sqrt{2}^5$ A1 for 565 or 566 given as answer dependent on working seen

Question		Working	Answer	Mark	Notes
*22			Cats with reason	3	M1 for Dogs risk is $0.5 \times 0.3 \times 360$ (= 54) or 15×360 (= 5400) oe or Cats risk is $0.3 \times 0.6 \times 310$ (= 55.80) or 18×310 (= 5580) oe or Other pets risk is $0.2 \times 0.1 \times 160$ (= 3.20) or 2×160 (= 320) oe A1 for three correct values for the risk for each pet type that can be used for comparison. C1 ft (dep on M1) for a statement comparing their calculated risks
23	(a)		843.75	2	M1 for $\left(\frac{15}{10}\right)^3$ oe. or $\left(\frac{10}{15}\right)^3$ oe A1 for 843(.75)
	(b)		14.4	2	M1 for a complete method e.g. $90 \div \left(\frac{25}{10}\right)^2$ or $90 \times \left(\frac{10}{25}\right)^2$ oe A1 for 14.4

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: 5AM2H_01		
Question	**Modification**	**Notes**
Q1	2cm grid. Right axis labelled	
Q2	Kept the same m to metres	
Q3	Diagrams removed – information given instead	
Q8	Model supplied as well as diagram	
Q10	Just a rectangle given not full TV set	
Q11	x axis – 1 ½ cm for 1. y axis 1 ½ cm for 5	
Q12	x axis 1 ½ cm for 45 minutes. y axis 1 ½ cm for ½. Graph line to go through 05.15 and 12.45 at 5 metres	

PAPER: 5AM2H_01			
Question		**Modification**	**Notes**
Q14	(a)	Drawing of TV mast removed. Vertical line labelled 'TV mast'. 'Horizontal ground' labelled	
	(b)	Just triangle given. Wording changed to 'The diagram shows the front face of a ramp'	
Q15		2 cm for 5 both axis	
Q16		Model supplied as well as diagram	
Q17		Model supplied as well as diagram. Diagram is a cross section of the tank	
Q20		2 cm for 5 both axes	
Q22		size × 2	
Q23		No pictures	