

Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics
Higher: (Calculator) Unit 2

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
1	(a)		$t = 6x + 12y$	3	B3 for $t = 6x + 12y$ (B2 for $t = [\text{linear expression in } x \text{ and } y]$ or $6x + 12y$) (B1 for $6x$ or $6y$ or $t = [\text{linear expression in } x \text{ or } y]$)
	(b)		15	2	M1 for $600 \div 40$ or $600 \times \frac{1}{40}$ A1 cao
2	(a)		1300	1	B1 oe
	(b)		5	1	B1 cao
	(c)		1.4	2	M1 0.6 to 2 or $2 - 0.6$ oe A1 cao
	(d)		Graph complete	2	B1 horiz. line from 1340 to 1350 B1 horiz line starting at 1340 and line of negative gradient joining graph (ft) to (1415,0)

PAPER: 5AM2H_01

Question	Working	Answer	Mark	Notes
*3		5 kg	4	<p>M1 for one of $1.90 \div 2 (=0.95)$, $4.35 \div 5 (=0.87)$; $8.45 \div 9 (=0.93(888..))$ M1 for all of $1.90 \div 2 (=0.95)$, $4.35 \div 5 (=0.87)$; $8.45 \div 9 (=0.93(888..))$ A1 for all 3 answers correct C1 (dep on M1) for a comparison of their answers leading to a correct deduction (ft). OR M1 for one of $2 \div 1.90 (=1.05(26..))$, $5 \div 4.35 (=1.14(9..))$, $9 \div 8.45 (=1.06(5...))$ M1 for all of $2 \div 1.90 (=1.05(26..))$, $5 \div 4.35 (=1.14(9..))$, $9 \div 8.45 (=1.06(5...))$ A1 for all 3 answers correct C1 (dep on at least M1) for a statement comparing of their three values leading to a correct deduction (ft). OR M1 price of 2 comparable quantities e.g $1.90 \times 5 \div 2 (=4.75)$ M1 price of 3 comparable quantities A1 for all 3 answers correct C1 (dep on M1) for a comparison of their answers leading to a correct deduction (ft).</p>

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
4			4.20	4	M1 for $30 \div (2 + 1)$ (=10) M1 for "10" $\times 2 \times 2.8$ (=56) oe M1 for $(98 - \text{"56"}) \div \text{"10"}$ A1 cao 4.2(0) OR algebraic approach M1 for (eg) $c=2a$ and $c+a=30$ M1 for (eg) $2.8c+wa=98$ M1 for ($w=$) $(98 - \text{"56"}) \div \text{"10"}$ A1 cao 4.2(0) [SC B2 for 3.5(0) as final answer]
5			77	3	M1 for $21 \div 6$ (=3.5) for sf length or $21 \div 6 \times 5$ (=17.5) M1 for $3 \times \text{"3.5"} + 3 \times \text{"3.5"} + 21 + 21$ or $17.5+17.5+21+21$ oe A1 cao OR M1 for $21 \div 6$ (=3.5) for sf length M1 for $(6+5+6+5) \times \text{"3.5"}$ or 22×3.5 oe A1 cao

PAPER: 5AM2H_01

Question	Working	Answer	Mark	Notes
*6		Needed: 10 eggs 1 kg flour	5	M1 number of cupcakes is $90 \times 2 + 120 (=300)$ M1 scaling " $300 \div 12 (=25)$ " M1 needed $200 \times "25"$ or $4 \times "25"$ or $240 \times "25"$ or 5000 or 100 or 6000 A1 5000 (g) and 100 (eggs) and 6000 (g) C1 (dep on at least M1) correct statement of which items are needed with quantities and units OR M1 number of cupcakes is $90 \times 2 + 120 (=300)$ M1 scaling " $300 \div 12 (=25)$ " M1 no. cupcakes $5 \div "25"$ or $90 \div "25"$ A1 0.2, 3.6, 0.2 f C1 (dep on at least M1) correct statement of which items are needed with quantities and units. OR M1 number of cupcakes is $90 \times 2 + 120 (=300)$ M1 $200 \div 12(=16.6.)$, $4 \div 12(= 0.33.)$, $240 \div 12 (=20)$ M1 " $300 \times "16.6"$ " and " $300 \times "0.33"$ " and " $300 \times "16.6"$ " A1 5000 (g) and 100 (eggs) and 6000 g C1 (dep on at least M1) correct statement of which items are needed with quantities and units

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
7	(a)		$\frac{7}{27}$	2	M1 for $\frac{7}{12+7+8}$ A1 for $\frac{7}{27}$ oe
	(b)		30	3	M1 for $1 - 0.4 (=0.6)$ M1 for $18 \div 6 \times 10$ or $18 \div "0.6"$ A1 cao
8			326	5	M1 for $55^2 + 40^2$ M1 for $\sqrt{3025+1600}$ or $\sqrt{4625}$ A1 for 68(.00735...) M1 for $40 + 40 + 55 + 55 + "68" + "68"$ OR $2 \times ("68" + 55 + 40)$ A1 for 326 or better

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
*9			70°	3	M1 for angle $MDC = 70^\circ$ or for $90 - (180 - 90 - 70)$ A1 cao C1 for <u>Alternate angles</u> are equal and Base <u>angles</u> of an <u>isosceles</u> triangle are <u>equal</u> . OR M1 for angle $MCB = 20^\circ$ or for $180 - (90 + 70)$ A1 cao C1 for <u>Angles</u> in a <u>triangle</u> add up to <u>180°</u> and <u>angles</u> of a <u>rectangle</u> are <u>90°</u>
10	(a)		155	2	M1 for $360-335 (=25)$ or $180-25$ or a diagram showing the correct bearing identified A1 cao
	(b)		1 h 28 min to 1 h 29 min	3	M1 for distance \div speed or $185 \div 125$ A1 for 1.48 oe B1 appropriate units

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
11	(a)		$x^3 - x^2 = 24$	2	M1 for $x \times [x \times x - \frac{1}{2} (x \times 2)]$ or $x \times [x(x - 2) + \frac{1}{2} (x \times 2)]$ or $\frac{1}{2} x \times [x - 2 + x] \times x$ A1 rearrangement to $x^3 - x^2 = 24$
	(b)	$x \quad x^3 - x^2$ 3 18 4 48 3.1 20.(181) 3.2 22.(528) 3.3 25.(047) 3.4 27.(744) 3.5 30.(625) 3.25 23.7(6563) 3.26 24.0(1838) 3.27 24.2(7288) 3.28 24.5(2915) 3.29 24.7(8719) 3.31 25.3(0859) 3.32 25.5(7197) 3.33 25.8(3714) 3.34 26.1(041) 3.35 26.3(7288)	3.3	4	B2 for trial $3.2 \leq x \leq 3.3$ (B1 for trial $3 \leq x \leq 4$) B1 for a different trial $3.25 \leq x \leq 3.27$ B1 (dep on at least one previous B1) for 3.3 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but to 1dp (rounded or truncated) if the value of x is to 2 dp NB: no working scores no marks, even if the answer is correct. All trials must be evaluated.

PAPER: 5AM2H_01				
Question	Working	Answer	Mark	Notes
12	Jan x Feb $2x$ Mar $2x + 10$ Apr $\frac{1}{2}(2x + 10)$ $x + 2x + 2x + 10 + \frac{1}{2}(2x + 10) > 123$ $6x + 15 \geq 123$	18	5	M1 for a method to express all 4 months' amounts algebraically (at least 3 correct, ft) M1 for an expression for total with at least 3 correct terms added M1 for a correct inequality stated algebraically M1 for an inequality reduced to $ax > b - c$ A1 cao NB: accept inequalities written as equations SC T&I is 5 marks for 18, otherwise 0 marks
13		248.5 – 248.6	3	M1 for sight of 82.5 or 81.5 or 3.15 or 3.05 M1 for 81.5×3.05 A1 for 248.5 – 248.6
14	(a)	716.3	3	M1 for $\pi r^2 = \pi \times 6^2$ (=113.09734.. or 36π) M1 for $2\pi r \times 16 = 2 \times \pi \times 6 \times 16$ (=603.18579.. or 192π) A1 716 – 717 or 228π Allow 829-330 or 264π [base included]
	(b)	7.96	4	M1 for $225\,000 \div 1000$ (=225) M1 for “225” = $\pi \times 3^2 \times h$ oe M1 rearrange to $h = \frac{“225”}{\pi \times 3^2}$ oe A1 7.95 – 7.96

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
15	(a)		0.22,0.78,0.74,0.26	2	B1 for 0.78,0.22 correctly placed B1 for 0.26,0.74 correctly placed
	*(b)		No As $0.454 < 0.5$	4	M1 for $0.55 \times "0.22"$ or $0.45 \times "0.74"$ oe M1 for $0.55 \times "0.22" + 0.45 \times "0.74"$ oe A1 for 0.454 oe C1 (dep on M1) for conclusive statement based on their answer compared to 50%

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
16	(a)		176	5	M1 for $\tan 30 = \frac{AD}{300}$ M1 for $AD = 300 \times \tan 30$ A1 for ($AD=$) 173 – 174 M1 for $\tan 20 = \frac{"173"}{AC}$ or $AC = \frac{"173"}{\tan 20}$ (=475.877) A1 175 – 176 OR M1 for $\cos 30 = \frac{300}{DB}$ M1 for $DB = \frac{300}{\cos 30}$ A1 for ($DB=$) 346(.41....) M1 for $\frac{BC}{\sin 10} = \frac{"346.4.."}{\sin 20}$ or $BC = \frac{"346.41..." \times \sin 10}{\sin 20}$ A1 175 – 176
	(b)		62.5°	3	M1 for speed = k × angle oe M1 for 16 = k × 20 or speed = 0.8 × angle oe A1 cao
17	(a)		25.5	2	M1 for 3000×8.5 A1 cao
	(b)		2.187×10^6	3	M1 for $\left(\frac{225}{0.25}\right)^3$ or 900^3 oe or $\left(\frac{225}{25}\right)^3$ or 9^3 M1 for correct conversion of units (cm^3 to m^3) A1 cao

PAPER: 5AM2H_01

Question	Working	Answer	Mark	Notes
18		$\frac{94}{132}$	5	<p>M1 for use of 11 as denominator for 2nd probability</p> <p>M1 for $\frac{3}{12} \times \frac{4}{11}$ or $\frac{3}{12} \times \frac{5}{11}$ or $\frac{4}{12} \times \frac{3}{11}$ or $\frac{4}{12} \times \frac{5}{11}$ or $\frac{5}{12} \times \frac{3}{11}$ or $\frac{5}{12} \times \frac{4}{11}$</p> <p>M2 for $\frac{3}{12} \times \frac{4}{11} + \frac{3}{12} \times \frac{5}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{4}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{3}{11} + \frac{5}{12} \times \frac{4}{11}$</p> <p>(M1 for at least 3 of these)</p> <p>A1 for $\frac{94}{132}$ oe</p> <p>OR</p> <p>M1 for use of 11 as denominator for 2nd probability</p> <p>M1 for $\frac{3}{12} \times \frac{2}{11}$ or $\frac{4}{12} \times \frac{3}{11}$ or $\frac{5}{12} \times \frac{4}{11}$</p> <p>M1 for $\frac{3}{12} \times \frac{2}{11} + \frac{4}{12} \times \frac{3}{11} + \frac{5}{12} \times \frac{4}{11}$ ($= \frac{38}{132}$)</p> <p>M1 for $1 - \left(\frac{38}{132}\right)$</p> <p>A1 for $\frac{94}{132}$ oe</p> <p>SC: B2 for $\frac{106}{144}$ oe</p> <p>or B1 for $\frac{3}{12} \times \frac{2}{12} + \frac{4}{12} \times \frac{3}{12} + \frac{5}{12} \times \frac{4}{12}$ or $\frac{38}{144}$ oe</p>

PAPER: 5AM2H_01

Question		Working	Answer	Mark	Notes
19	(a)	$2 \times \left(\frac{2 \times (2 + 1.5)}{2} + \frac{1.5}{2} \right) = 2 \times (3.5 + 0.75)$ 5) or $2 \times \left(\frac{2 + 1.875}{2} + \frac{1.875 + 1.5}{2} + \frac{1.5 + 0.875}{2} + \frac{0.875}{2} \right) =$ $2 \times (1.9375 + 1.6875 + 1.1875 + 0.4375)$ $= 2 \times 5.25$	8 – 10.6	4	M1 for use of at least one triangle or rectangle or trapezium to calculate an approximation to the area under the curve. M1 for any correct calculation of the area of at least one appropriate triangle or trapezium or rectangle. M1 for any correct method that would lead to an answer in the interval 8 – 10.6 A1 8 – 10.6
	(b)		explanation	1	eg take more strips oe

PAPER: 5AM2H_01				
Question	Working	Answer	Mark	Notes
20	2 1800 3 2414.95 4 3240 5 4346.916 6 5832 7 7824.45 8 10497.6	8	5	<p>M1 for introducing a fully defined growth factor eg Growth factor = $\frac{100+x}{100}$</p> <p>M1 $1000 \times \left(\frac{100+x}{100}\right)^2 = 1800$ or $\left(\frac{100+x}{100}\right)^2 = \frac{1800}{1000} = 1.8$</p> <p>M1 $\frac{(100+x)}{100} = \sqrt{1.8}$ (= 1.34..) leading to $x = 34$ or 34%</p> <p>M1 $1000 \times ("1.34..")^7$ (=824(.45..)) or $1000 \times ("1.34..")^8$ (=10497(.6..)) oe A1 cao</p> <p>OR</p> <p>M1 for introducing a fully defined growth factor eg $p=ka^t$ M1 $1000 = ka^0$ at $t=0$, or $k=1000$ or $p=1000a^t$ M1 for use when $t=2$ eg when $t=2$, $1800=1000a^2$; $a=1341.641..$ $p=1000 \times 1.341^t$ M1 $1000 \times ("1.34..")^7$ (=824(.45..)) or $1000 \times ("1.34..")^8$ (=10497(.6..)) oe A1 cao</p>

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

PAPER: 5AM1H_01		
Question	Modification	Notes
Q02	Beginning of graph changed (1300, 0) (1305, 0.5) (1310, 0.5) (1320, 2) – rest of graph line remains. Vertical axis 1½ cm for 0.5 Horizontal axis 1½ cm for 5 minutes	
Q03	Diagrams removed	
Q04	Picture removed	
Q05	Diagram: 5 cm moved to left 6 cm and 21 cm at top Headings put at the top	
Q08	40 cm and 55 cm moved to the left and top of diagram	

PAPER: 5AM1H_01			
Question		Modification	Notes
Q10		Diagram given with Manchester and London marked and joined with a dashed line and N lines going up from each place	
Q11		Model provided for all candidates. Diagram provided for MLP.	
Q13		3.1 moved to the left of the diagram	
Q14		Model provided for all candidates. Cross section diagram provided for MLP	
Q15		Decision tree diagram enlarged Braille only: Roman numerals (i) to (iv) placed on answer lines	
Q15	(a)	Wording added: There are four spaces to fill	
Q16		Wording added 'The distance AB is 300 metres'	
Q17		2 models provided for all candidates Diagram provided for MLP	

