

Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Methods in 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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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: 5MM2H_01

Question		Working	Answer	Mark	Notes
1	(a)	$152 \times 3 = 456$ $152 \times 4 = 608$	456 , 608	2	M1 for $1064 \div (3 + 4)$ (= 152) A1 cao
	(b)		56.25	3	M1 for $\frac{9}{7+9}$ or $\frac{7}{7+9}$ oe M1 for a complete method to find percentage, eg. $\frac{9(\text{or } 7)}{7+9} \times 100$ A1 cao; ignore any rounding or truncating if 56.25 seen
2			231	3	M1 for a correct method to find 17.5% of 280; eg. $\frac{17.5}{100} \times 280$ (= 49) M1 (dep) for $280 - "49"$ A1 cao OR M1 for $100 - 17.5$ (= 82.5) M1 (dep) for a correct method to find 82.5% of 280; eg. 280×0.825 A1 cao

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Question		Working	Answer	Mark	Notes
3	(a)		73.1	3	M1 for a method to find circumference of the circle; eg. $\pi \times 16$ or 50.26... M1 for a fully complete method, eg. $\pi \times 16 \div 2 + 3 \times 16$ A1 for answer in range 73.1 to 73.2
	(b)		60.7	4	M1 for $16 \times 16 (= 256)$ M1 for a correct method to find the area of the circle; eg. $\pi \times 8 \times 8 (= 64\pi$ or 201.06....) M1(dep on M1) for a fully complete method to find the required percentage; eg. $(\text{"256"} - \text{"64}\pi \div 2\text{"}) \div \text{"256"} \times 100$ A1 for answer in range 60.7 to 60.8

PAPER: 5MM2H_01

Question	Working	Answer	Mark	Notes
*5		Rectangular face is greater with supporting working	6	<p>M1 for a correct method to find 12% of 600; eg. 0.12×600 (= 72), the area of each rectangle M1 (dep) for the total area of the 4 rectangles, eg. $4 \times "72"$ (= 288) M1 (indep) for the total area of the 4 triangles, eg. 4×62 (= 248) M1 for $600 - 4 \times "72" - "4 \times 62"$ A1 for 64 C1 ft (dep M3) for a clear statement that the area of the rectangle is greater OR M1 for $62 \div 600 \times 100$ (= $10\frac{1}{3}$ (%)) M1 (dep) for $4 \times "10\frac{1}{3}"$ (= $41\frac{1}{3}$ (%)) M1 (indep) for 4×12 or 48(%) M1 for $100 - "4 \times 12" - 4 \times "10\frac{1}{3}"$ A1 for $10\frac{2}{3}$ (%) C1 ft (dep M3) for a clear statement that the area of the rectangle is greater</p>

PAPER: 5MM2H_01

Question		Working	Answer	Mark	Notes
6	(a)		160	3	M1 for a correct method to find the area of the cross section; eg. $\frac{5}{2}(7 + 9) (= 40)$ or for a correct method to find the volume of an appropriate prism, eg. $5 \times 7 \times 4 (= 140)$ or $5 \times 9 \times 4 (= 180)$ M1 (dep) for a correct method to find the required volume; eg. "40" \times 4 or "140" + 0.5 \times 2 \times 5 \times 4 or "180" - 0.5 \times 2 \times 5 \times 4 A1 cao
	(b)		5.39	4	M1 for $9 - 7 (= 2)$ M1 for $5^2 + "2"{}^2$ M1 for $\sqrt{5^2 + "2"{}^2} (= \sqrt{"29"})$ A1 in the range 5.3 - 5.4

PAPER: 5MM2H_01

Question	Working	Answer	Mark	Notes
7		$\frac{39}{80}$	4	<p>M1 for a correct method to find $\frac{2}{5}$ of 40; eg. $40 \div 5 \times 2 (= 16)$ or for a correct method to find $\frac{5}{8}$ of 40; eg. $40 \div 8 \times 5 (= 25)$ M1 for a correct method to find $\frac{2}{5}$ of 40 and $\frac{5}{8}$ of 40 M1 (dep on M1) for $80 - "16" - "25" (= 39)$ or $\frac{"16" + "25"}{80} (= \frac{41}{80})$ A1 $\frac{39}{80}$ oe</p> <p>OR</p> <p>M1 for $1 - \frac{2}{5} (= \frac{3}{5})$ and $1 - \frac{5}{8} (= \frac{3}{8})$ M1 for a correct method to find $\frac{3}{5}$ of 40; eg. $40 \div 5 \times 3 (= 24)$ or for a correct method to find $\frac{3}{8}$ of 40; eg. $40 \div 8 \times 3 (= 15)$ M1 (dep on M1) for $"24" + "15" (= 39)$ A1 $\frac{39}{80}$ oe</p>

PAPER: 5MM2H_01

Question		Working	Answer	Mark	Notes																		
8	(a)	<table border="1"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> </tr> <tr> <td>y</td> <td>18</td> <td>7</td> <td>0</td> </tr> </table> <table border="1"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>-3</td> <td>-2</td> <td>3</td> <td>12</td> </tr> </table>	x	-2	-1	0	y	18	7	0	x	1	2	3	4	y	-3	-2	3	12	18, 0, -3, -2, 12	2	B2 all correct (B1 any three correct)
	x	-2	-1	0																			
	y	18	7	0																			
x	1	2	3	4																			
y	-3	-2	3	12																			
(b)			Correct graph	2	M1 for 5 or more "points" plotted correctly, provided at least B1 scored in (a) A1 cao for the correct graph																		
(c)			3.2 to 3.3 and -0.8 to -0.7	2	M1 for $y = 5$ drawn or an answer in the range 3.2 to 3.3 or in the range -0.8 to -0.7 or ft their graph (accept answers written as coordinates). A1 for answers in the ranges 3.2 to 3.3 and -0.8 to -0.7 or ft their graph (do not accept answers written as coordinates).																		

PAPER: 5MM2H_01

Question		Working	Answer	Mark	Notes
*9			77° and reasons	4	<p>M1 for a correct method to find an angle which could then be used to find x; eg. $180 - 123 (= 57)$ or angle $ACB = 46$ M1 for a complete method which could lead to the answer C2 (dep on M2) for $x = 77$ cao and all correct reasons given for their choice of method. (C1 (dep on M1) for one correct reason linked to their M1)</p> <p>Reasons include: <u>exterior angle</u> of a triangle is equal to the sum of the <u>interior opposite angles</u> <u>corresponding angles</u> on parallel lines are equal <u>alternate angles</u> on parallel lines are equal <u>angles</u> in a <u>triangle</u> add up to <u>180</u> <u>angles</u> on a <u>straight line</u> add up to <u>180</u> <u>allied angles</u> add up to <u>180</u> <u>vertically opposite angles</u> are equal</p>
10	(a)		0.236696(15....)	2	M1 for 13.69 seen or 3.24... seen A1 for 0.2366(9615..)
	(b)		216	1	B1 cao
	(c)		4 or -4 or ±4	1	B1 for 4 or -4 or ±4

PAPER: 5MM2H_01

Question		Working	Answer	Mark	Notes
11	(a)		7.52	3	M1 for $\tan 62 = \frac{\text{opp}}{4}$ M1 for $4 \times \tan 62$ A1 for answer in the range 7.52 to 7.53
	(b)		25.9	3	M1 for $\sin(x) = \frac{7}{16}$ (= 0.4375) M1 for $\sin^{-1}\left(\frac{7}{16}\right)$ A1 for answer in the range 25.9 to 26.0 [SC: B1 for answer in the range 64.0 to 64.1]
12			70.7	3	M1 for $2 \times \pi \times 9$ (= 56.5486...) M1 for a complete and correct method, A1 answer in the range 70.5 to 71.0
13			$y = 3x - 1$	3	B1 for gradient of 3 M1 for substitution into $y = mx + c$; eg. $5 = 3 \times 2 + c$ oe or $\frac{y-5}{x-2} = 3$ oe A1 for $y = 3x - 1$ oe [SC: B1 for $y = 3x + \text{any constant}$]

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Question		Working	Answer	Mark	Notes
14	(a)		$x = \frac{y-6}{2}$	3	M1 for $3x + 6 = y + x$ or $x + 2 = \frac{y+x}{3}$ M1 for correctly isolating terms in x and other terms on opposite sides in an equation; eg. $3x - x = y - 6$ or $x - \frac{x}{3} = \frac{y}{3} - 2$ A1 for $x = \frac{y-6}{2}$ oe
	(b)		6.91, -3.91	3	M1 for $\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (-27)}}{2 \times 1}$, condone one sign error in substitution M1 for $x = \frac{3 \pm \sqrt{117}}{2}$ A1 6.90 to 6.91 and -3.90 to -3.91
15			9	3	M1 for $180 - 140 (= 40)$ [Note: the 40 may be shown on the diagram] M1 for $360 \div "40"$ A1 cao OR M1 for $\frac{n-2}{n} \times 180 = 140$ M1 for $360 \div "40"$ A1 cao

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Question		Working	Answer	Mark	Notes
16			80.5 or 8.05×10^1	2	M1 for 2.415×10^8 (or 241500000) or 3×10^6 (or 3000000) A1 for 80.5 or 8.05×10^1
17			1.92% (increase)	3	M1 for 1.12 or any correct method to increase a number by 12% or 0.91 or any correct method to decrease a number by 9% M1 for a fully correct method to increase by 12% and then decrease by 9%; eg. 1.12×0.91 (= 1.0192) or 0.0192 seen A1 for 1.92% (increase)
18			6.06	5	B1 for $sf = 9 \div 6$ (= 1.5) oe or $6 \div 9$ (= 0.66..) oe or $QP = 6$ M1 for a correct statement of the cosine rule with correct two sides and angle substituted; eg. $4^2 + 6^2 - 2 \times 4 \times 6 \times \cos 42$ M1 ft for a fully correct rearrangement of the cosine rule to give a correct value for MN^2 or QR^2 ; eg. $52 - 35.6709..$ (= 16.3290...) M1 for a correct use of their scale factor; eg. $4.04092.. \times 1.5$ or 4×1.5 (= 6) A1 for answer in the range 6.06 to 6.07

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Question	Working	Answer	Mark	Notes
19		$\frac{1}{16}$	4	M1 for $S \propto \frac{1}{t^3}$ or $S = \frac{k}{t^3}$ M1 for $\frac{1}{2} = \frac{k}{4^3}$ oe or $S = \frac{32}{t^3}$ M1 $S = \frac{32}{8^3}$ oe A1 for $\frac{1}{16}$ oe
20		4 : 9	2	M1 for $\pi \times 2^2 \times h (= 4\pi h)$ and $\pi \times 3^2 \times h (= 9\pi h)$ A1 for 4 : 9 oe or M1 for $\left(\frac{6}{4}\right)^2$ oe A1 for 4 : 9 oe [SC: B1 for 9 : 4 oe if M0 scored]

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Question		Working	Answer	Mark	Notes
*21			$\frac{1}{16}$	4	M1 for $S \propto \frac{1}{t^3}$ or $S = \frac{k}{t^3}$ M1 for $\frac{1}{2} = \frac{k}{4^3}$ oe or $S = \frac{32}{t^3}$ M1 $S = \frac{32}{8^3}$ oe A1 for $\frac{1}{16}$ oe
22	(i)		(-2, 5)	2	B1 cao
	(ii)		(4, 3)		B1 cao
23		$x^2 + (2x + 1)^2 = 2$ $x^2 + 4x^2 + 4x + 1 = 2$ $5x^2 + 4x - 1 = 0$ $(5x - 1)(x + 1)$	$x = 0.2, y = 1.4$ and $x = -1, y = -1$	6	M1 for $x^2 + (2x + 1)^2 = 2$ or $(y^2) = (2x + 1)^2$ M1 for $x^2 + 4x^2 + 4x + 1 = 2$ A1 for $5x^2 + 4x - 1 = 0$ M1 (dep M1) for factorising their quadratic, eg. $(5x - 1)(x + 1)$ or for correct substitution into the quadratic formula A1 for $x = 0.2$ and $x = -1$ A1 for $x = 0.2, y = 1.4$ and $x = -1, y = -1$

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: 5MM2H_01			
Question		Modification	Notes
Q05		Model provided for all candidates. Diagram also provided for MLP.	
Q06		Model provided for all candidates. Diagram also provided for MLP. Wording added: Angle ABC = angle BAD = 90°	
Q08		y axis: 1 square for 1. x axis: 1 square for 0.5	
Q12		Model provided for all candidates. Diagram also provided for MLP.	
Q14	(a)	MLP x changed to e y changed to f	

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Question	Modification	Notes
Q18	<p>Wording added:</p> <p>In triangle LMN, LM = 4 cm LN = 6 cm Angle MLN = 42°</p> <p>In triangle PQR, PR = 9 cm Angle QPR = 42° Angle MNL = angle QRP</p>	
Q20	<p>Model provided for all candidates. Diagram also provided for MLP.</p>	

