

Mark Scheme (Results)

November 2015

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Calculator) Unit 3

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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.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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.

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 (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

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Question		Working	Answer	Mark	Notes
1	(a)		2.47	2	M1 for 7.66... A1 for 2.47 – 2.48
	(b)		400	1	B1 for 400 or 4×10^2
2	(a)		Correct point marked	3	M1 for line bearing 300° M1 for line bearing 40° A1 cao
	(b)		4.15	2	M1 for “8.3” $\times 50\,000$ (=415 000) A1 for 4.10 – 4.25
*3			Bottle with reason	5	Cans M1 for $30 \times 0.28 - 10 \times 0.25$ (=5.9) oe Bottles M1 0.15×1.60 (=£0.24) oe or 0.15×6.40 (=0.96) oe M1 (dep) for $1.60 - 0.24$ (=£1.36 per bottle, or £5.44 for 4 bottles) oe Best value M1 for “1.36” $\div 2.5$ (=0.544 £/litre) <u>and</u> “5.9” $\div 9.9$ (=0.595...£/litre) oe C1 (dep on M1) for 0.544 and 0.595... and bottle identified OR M1 for $2.5 \div “1.36$ (=1.83... litres/£) and $9.9 \div “5.9”$ (=1.67... litres/£) C1 (dep on M1) for 1.67... and 1.83... and bottle identified
4	(a)		translation $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$ (B0 if not single transformation)
	(b)		Triangle	2	B2 cao (B1 for rotation a 180 degrees about any point or for a rotation about (0, 1))

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Question	Working	Answer	Mark	Notes																																		
5		17.6	3	M1 for $8 \div 5 (=1.6)$ or $5 \div 8 (=0.625)$ M1 for $(16 - 5) \times "1.6"$ or for $(16 - 5) \div "0.625"$ oe A1 cao																																		
6		bisector	2	M1 for an appropriate pair of arcs or correct line drawn without construction arcs A1 for perpendicular bisector of AB drawn with a pair of construction arcs																																		
7	<table border="1"> <thead> <tr> <th>x</th> <th>$x^3 - 9x$</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>28</td> </tr> <tr> <td>4.1</td> <td>32.(021)</td> </tr> <tr> <td>4.2</td> <td>36.(288)</td> </tr> <tr> <td>4.3</td> <td>40.(807)</td> </tr> <tr> <td>4.4</td> <td>45.(584)</td> </tr> <tr> <td>4.5</td> <td>50.(625)</td> </tr> <tr> <td>4.6</td> <td>55.(936)</td> </tr> <tr> <td>4.7</td> <td>61,(523)</td> </tr> <tr> <td>4.8</td> <td>67.(392)</td> </tr> <tr> <td>4.9</td> <td>73.(549)</td> </tr> <tr> <td>5</td> <td>80</td> </tr> <tr> <td>4.41</td> <td>46.0(7612)</td> </tr> <tr> <td>4.42</td> <td>46.5(7089)</td> </tr> <tr> <td>4.43</td> <td>47.0(6831)</td> </tr> <tr> <td>4.44</td> <td>47.5(6838)</td> </tr> <tr> <td>4.45</td> <td>48.0(7113)</td> </tr> </tbody> </table>	x	$x^3 - 9x$	4	28	4.1	32.(021)	4.2	36.(288)	4.3	40.(807)	4.4	45.(584)	4.5	50.(625)	4.6	55.(936)	4.7	61,(523)	4.8	67.(392)	4.9	73.(549)	5	80	4.41	46.0(7612)	4.42	46.5(7089)	4.43	47.0(6831)	4.44	47.5(6838)	4.45	48.0(7113)	4.4	4	B2 for a trial $4.4 \leq x \leq 4.5$ (B1 for a trial evaluated correctly for $4 \leq x \leq 5$) B1 for a different trial evaluated correctly for $4.41 \leq x \leq 4.5$ B1 (dep on at least one previous B1) for 4.4 [Note trials should be evaluated to at least accuracy indicated in the table, truncated or rounded] [NB B0 No working scores 0 marks]
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Question	Working	Answer	Mark	Notes
8		180	3	M1 for area of cross section, eg $3 \times 2 + 3 \times 4 + 3 \times 6 (=36)$ or $9 \times 6 - 3 \times 3 \times 2 (=36)$ M1 for "36" $\times 5$ A1 cao OR M1 for area of one cuboid eg $3 \times 2 \times 5 (=30)$ M1 for $6 \times "30"$ A1 cao OR M1 for $4.5 \times 8 (=36)$ M1 for "36" $\times 5$ A1 cao
9	(a)	0, 4, 3, -5	2	M1 for one correct value, could be taken from graph A1 cao
	(b)	correct curve	2	M1 for at least 4 points plotted correctly from table A1 for correct curve drawn
10		11	4	M1 for introducing variable eg x or $x+3$ or $2x+6$ M1 (dep) for " x " + " $(x+3)$ " + " $(2x+)$ " = 53 M1 for complete method to isolate x A1 cao
11	(a)	$x > -4$	1	B1 cao
	(b)	$y \leq 3$	2	M1 for intention to isolate y or for $y = 3$ or $y < 3$ A1 cao
	(c)	-1,0,1	2	M1 for listing -3, -2, -1,0,1 or -1, 0,1,2,3 or for $-2 < ? < 2$ A1 for -1,0,1
12		1.01	3	M1 for $1.2 \times 15 (= 18)$ or 1×250 clearly defined as mass M1 for $\frac{"18" + "250"}{15+250}$ A1 for 1.01(1...)

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Question	Working	Answer	Mark	Notes
*13		36% depreciation	3	<p>M1 for $0.8 \times 0.8 (=0.64)$ M1 for $1 - "0.64" (=0.36)$ C1 for 36% (depreciation) oe or compares cost with 40% reduction OR (uses a trial value, eg 1000) M1 for $1000 \times (0.8)^2 (=640)$ M1 for $(1000 - 640) \div 1000 (=0.36)$ C1 for 36% (depreciation) oe or compares cost with 40% reduction OR M1 for $0.2 \times 0.2 (=0.04)$ M1 for $0.2 + 0.2 - "0.04" (=0.36)$ C1 for 36% (depreciation) oe or compares cost with 40% reduction OR C1 only for identifying the 2nd 20% reduction is off the reduced amount at the end of the first year</p>
14		$t = \frac{ap^2}{3}$	3	<p>M1 for squaring both sides of the equation as the first step M1 (dep) for isolating the t term A1 for $t = \frac{ap^2}{3}$ oe</p>
15		20.94	5	<p>M1 for method to find circumference of circle, eg. $2 \times \pi \times 2.45$ or $\pi \times 4.9 (= 15.393\dots)$ M1 (dep) for $\frac{105}{360} \times "15.393 \dots" (= 4.4898\dots)$ M1 for $"4.4898\dots" \div 1.75 (= 2.565\dots)$ or $"4.9" \div 1.75 (= 2.8)$ oe or $"9.3898\dots" \div 1.75 (=5.3656\dots)$ M1 for total cost = $"6" \times 3.49 (=20.94)$ or cost of arc or straight edges = $"3" \times 3.49 (=10.47)$ A1 cao</p>

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Question	Working	Answer	Mark	Notes
16		$\frac{4}{7}$	4	M1 for multiplication of all terms by a multiple of 6 eg $3(x+1) + 2(2x-1) = 5$ M1 for $3 \times x + 3 \times 1 (=3x+3) + 2 \times 2x - 2 \times 1 (=4x-2)$ oe or $3x+3+4x-2=5$ M1 (dep) for collecting like terms on each side of the equation eg $3x+4x = 5 -3 +2$ or $7x + 1 = 5$ or $7x = 4$ A1 for $\frac{4}{7}$ or 0.57...
*17		56 supported	3	M1 for $180 - 85 (=95)$ A1 for 56 C1 for <u>opposite angles</u> of a <u>cyclic quadrilateral</u> add up to <u>180</u>
18		$-\frac{3}{2}, \frac{5}{3}$	3	M1 for $(2x \pm 3)(3x \pm 5)$ M1 for $(2x + 3)(3x - 5)$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67 OR M1 for $\frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 6 \times -15}}{2 \times 6}$, condone one sign error M1 for $\frac{1 \pm \sqrt{361}}{12}$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67 OR M1 for $\left(x - \frac{1}{12}\right)^2 \pm \left(\frac{1}{12}\right)^2 \pm a = 0$ M1 for $\left(x - \frac{1}{12}\right)^2 = b$ A1 for $-\frac{3}{2}$ and $\frac{5}{3}$ oe accept 1.66 – 1.67
19		36	3	M1 for $100 = k \times 5^2$ oe or $(k=) 4$ M1 for $(y =) \frac{100}{5^2} \times 3^2$ or “4” $\times 3^2$ A1 cao

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Question	Working	Answer	Mark	Notes	
20		0.063	3	B1 for 252.5 or 247.5 or 3950 or 3850 M1 for $247.5 \div 3950$ or ft “lower bound for 250” \div “upper bound for 3900” A1 for 0.062–0.063 (from correct working)	
21	Eg $BQ = \sqrt{5^2 + 6^2} = \sqrt{61}$ Angle $ABQ = \tan^{-1}(6 \div 5) = 50.194^\circ$ $BP = \sqrt{61} \div \cos 30 = 9.018 \text{ cm}$ Angle $PBC = 90 - 30 - 50.194^\circ = 9.806^\circ$ $BC = 9.018 \times \cos 9.806 = 8.886\dots$ OR $BQ = \sqrt{5^2 + 6^2} = \sqrt{61}$ $PQ = \sqrt{61} \tan 30 = 4.509$ Angle $BQA = \tan^{-1}(5 \div 6) = 39.806$ Angle $PQD = 180 - 90 - 39.806 = 50.194^\circ$ $QD = 4.509 \times \cos 50.194 = 2.886\dots$	8.89	5	M1 for correct use of Pythagoras M1 for correct use of appropriate trig ratio M1 for correct use of appropriate inverse trig ratio M1 for correct method to calculate angle CBP or PQD A1 for 8.88 – 8.89	
22	(a)	(0, 1)	1	B1 cao	
	(b)	P(-1, 0), Q(1, 0)	2	2	M1 for “ a ” – “ $-a$ ” or $(x =) -1$ or $(x =) 1$ or “8” \div 4 A1 cao

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: 5MB3H_01			
Question		Modification	Notes
Q02		Harbour to Lighthouse = 10 cm. Harbour and Lighthouse are joined with a dashed line. North line extended.	
Q04	(a)	Grid enlarged.	
Q04	(b)	Question reversed. Triangle W given on grid. Candidates asked to describe the transformation of triangle T to triangle W.	
Q06		AB = 8 cm.	
Q08		Model provided for all candidates. MLP also given an enlarged diagram.	
Q09	(a)	Wording added above the table. There are four spaces to fill.	
Q09	(b)	Grid enlarged.	
Q11	(a)	Diagram enlarged.	

PAPER: 5MB3H_01

Question		Modification	Notes
Q14		All candidates, a changed to n.	
Q15		Diagram enlarged.	
Q16		MLP only: x changed to y.	
Q17		Diagram enlarged. Wording added: "Angle BAP is marked x."	
Q21		Diagram enlarged. Wording added: "BA = 5 cm. AQ = 6 cm. Angle PBQ = 30° ."	
Q22		Diagram enlarged.	

