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Mark Scheme (Results)

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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

Question		Working	Answer	Mark	Notes
PAPER: 5MB3H_01					
1			67200	2	M1 for 0.12 × 60000 (= 7200) oe A1 cao
2			40	2	M1 for 32 ÷ 20 (= 1.6) or 32 × 25 (= 800) or 20:25 (or use of) A1 cao
3			105.7	2	M1 for π × 5.8 × 5.8 oe A1 for 105.6 to 105.8
4			Perpendicular bisector	2	M1 for accurate line drawn without arcs, or appropriate arcs A1 accurate line and appropriate arcs drawn
5	(a)		Inequality drawn	2	B2 for all three features of −2, O and right arrow (B1 for two of these features)
	(b)		2	3	M1 for isolating the y terms A1 for $3y < 8$ or $3y = 8$ or better B1 ft
6	(a)		Triangle	2	B1 for triangle translated B1 for triangle at (−2,2), (−2,0), (−1,0)
	(b)		Rotation 90° anticlockwise centre (0,0)	3	B1 Rotation B1 90° anticlockwise oe B1 centre (0,0) Note Award no marks if more than one transformation is given

Question	Working	Answer	Mark	Notes
*7		Flow pumps	5	M1 for a correct first step, eg 4 × 35 (= 140 galls in 1 min or 8400 galls in 1 hour) or 1000000 ÷ 2100 (= 476 hours for 1 speedy pump) or 35 × 60 (= 2100 gallons in 1 hour) M1 for a correct method to find a time taken for one type of pump, eg 1000000 ÷ 8400 (= 119 hours) M1 for a correct method to find a time taken for the other type of pump (consistent), eg 500 ÷ 5 (= 100 hours) A1 for two correct comparable values, eg 119 (hours) and 100 (hours) C1 ft (dep M3) for conclusion of Flow pumps with correct figures for comparison OR M1 for a correct first step, eg 4 × 35 (= 140 galls in 1 min) M1 for a correct method to find the number of gallons pumped out by one type of pump in a certain time period, eg 1000000 ÷ 100 (= 10000 gall in 1 hour) M1 for a correct method to find the number of gallons pumped out by the other type of pump in a certain time period (consistent), eg for two correct comparable values, eg 10000 ÷ 60 (= 166 gallons in 1 min) A1 for 140 (galls in 1 min) and 166 (galls in 1 min) oe C1 ft (dep M3) for conclusion of Flow pumps with correct figures for comparison
8		2 000 000	2	M1 for 2 × 100 × 100 × 100 A1 oe

Question	Working	Answer	Mark	Notes
*9		Tymes shop	3	M1 for 80 − 18 (= 62) or for method to reduce 80 by 20% oe (= 80 − 16 = 64) A1 for 62 and 64 C1 for comparison using 62 and 64 OR M1 for method to find 20% of 80 (=16) A1 for 16 C1 for comparison using 16 and given 18 OR M1 for writing £18 as a % of £80 (= 22.5%) A1 for 22.5% C1 for comparison using 22.5% and 20%
10		C shown	3	M1 for correct angle of 70° M1 for correct angle of 320° A1 C marked unambiguously in the correct position
11		8.56	3	M1 for $5.2^2 + 6.8^2$ (= 73.28) M1 for $\sqrt{(5.2^2 + 6.8^2)}$ or $\sqrt{73.28}$ A1 for 8.5 – 8.6

Question	Working	Answer	Mark	Notes
12 (a)		Equation	2	M1 for $2x \times x \times (x + 4)$ A1 for clear working leading to $x^3 + 4x^2 = 90$
(b)	3 — 63 4 — 128 3.1 — 68.231 3.2 — 73.728 3.3 — 79.497 3.4 — 85.544 3.5 — 91.875 3.45 — 88.67363 3.46 — 89.30814 3.47 — 89.94552 3.48 — 90.58579	3.5	4	B2 for trial evaluated using $3 < x < 4$ (B1 for trial evaluated using $3 \leq x \leq 4$) B1 for a different trial evaluated using $3.4 \leq x \leq 3.5$ B1 (dep on at least one previous B1) for 3.5 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct 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.
13 (a)		−3 −2 −1 0 1 2 3 −5 **8** 9 **4** **−1** 0 13	2	B2 for all 3 correct values (B1 for 2 correct values)
(b)			2	M1 (dep on B1) for plotting at least 6 values from their table A1 for a correct graph
14		$x = 0.4, y = −2$	4	M1 for a correct method leading to either x or y (condone one error) A1 for $x = 0.4$ or $y = −2$ M1 for a correct substitution into one of the equation or a correct method leading to the second value A1 cao
15		$d = ep − ef$	2	M1 for isolating the term in d or multiplication of all terms by e as the first step A1 oe

Question	Working	Answer	Mark	Notes
*16			4	M1 for showing that *OAB* and *ODA* are isosceles (*OA*, *OB*, *OD* radii) or shows that *OD* bisects *AOB*. M1 for recognising that *AOB* = 120° (from *ACB* = 60°) A1 for identifying angles of ODA as 60° C1 (dep on M1) for conclusion that ODA is equilateral, and appropriate reason linked to shown method eg The <u>angle</u> at the <u>centre</u> of a circle is <u>twice the angle</u> at the <u>circumference</u>. OR M1 for showing that triangles *OAM* and *OBM* are congruent (*OM* common, *AM* = *MB* given, and *OA* = *OB* radii) M1 for showing *AOM* = 60° and *AO* = *OD* (radii) A1 for identifying angles of *ODA* as 60° C1 (dep on M1) for conclusion that *ODA* is equilateral, and appropriate reason linked to shown method eg The <u>angle</u> at the <u>centre</u> of a circle is <u>twice the angle</u> at the <u>circumference</u>.
17		16	2	M1 for 18 ÷ 24 (= 0.75) or 24 ÷ 18 (= 1.333) A1 cao
18		199 - 201	3	M1 for a correct first step, eg changes km/s to mph 13 × 2250 (= 29250 mph) M1 for finding time eg $\dfrac{1.4\times10^8}{"29250"}$ (= 4786 hours) A1 199 to 201 days OR M1 for a correct first step, eg changes km to miles $1.4 \times 10^8 \times 1.6$ (= 2.24×10^8) M1 for finding time eg $\dfrac{"2.24\times10^8"}{13}$ (= 17230769 seconds) A1 199 to 201 days

Question	Working	Answer	Mark	Notes
19 (a)		5 and −7	3	M1 for $(x \pm 5)(x \pm 7)$ M1 for $(x - 5)(x + 7)$ A1 cao OR M1 for correct substitution into formula M1 for reduction to $\dfrac{-2 \pm \sqrt{144}}{2}$ A1 cao
(b)		$\pm\sqrt{3}$	4	M1 for multiplying through by a common denominator eg by $(x + 1)(2x +3)$ M1 (dep) for reduction eg to $4x + 6 + x^2 + x$ or $2x^2 + 3x + 2x + 3$ M1 for $x^2 - 3 \, (= 0)$ A1 cao for both answers; accept decimals to at least 2 dp
20		$\dfrac{59}{330}$	3	M1 for $100x = 17.87878787\ldots$ or $1000x = 178.7878787\ldots$ **and** $10x = 1.7878787$ M1 (dep) for subtraction, $100x - x$ or $1000x - 10x$ or $\frac{17.7}{99}$ or $\frac{177}{990}$ seen A1 working leading to given fraction
21		7	2	M1 for $6000 \times (1.03)^n$ for $n > 2$ OR M1 for $7379.24 \div 6000 \, (= 1.2298733)$ A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**

22		8.64	5	M1 for $0.5 \times 9.3 \times 8 \times \sin BAC$
				A1 for $BAC = 59.34°$
				M1 for substitution into the cosine rule
				  eg $9.3^2 + 8^2 - 2 \times 9.3 \times 8 \times \cos"59.34"$
				M1 for correct order of calculation and $\sqrt{}$
				  eg $86.49 + 64 - 75.8777$ leading to $\sqrt{74.6123}$
				A1 8.6 to 8.7 with supporting working

23 (a)		199.75	1	B1 cao
*(b)		Yes	3	B1 for ub = 24.5 or 175.5 M1 ft for "24.5" + "175.5" (= 200) C1 (dep M1) for 200 and statement based on their working as to whether the cup will overflow (ie comparison with (a)).