Mark Scheme (Results)

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Pearson Edexcel International GCSE
Mathematics B (4MB1)
Paper 02R

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- 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.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

- **Types of mark**
    - M marks: method marks
    - A marks: accuracy marks
    - B marks: unconditional accuracy marks (independent of M marks)

- **Abbreviations**
    - cao – correct answer only
    - ft – follow through
    - isw – ignore subsequent working
    - SC - special case
    - oe – or equivalent (and appropriate)
    - dep – dependent
    - indep – independent
    - eeoo – each error or omission

- **No working**

    If no working is shown then correct answers normally score full marks

    If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **With working**

    If there is a wrong answer indicated always check the working in the body of the script and award any marks appropriate from the mark scheme.

    If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

    If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.
    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 there are multiple attempts shown, then all attempts should be marked and the highest score on a single attempt should be awarded.

- **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.

- **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: eg. incorrect cancelling of a fraction that would otherwise be correct.

  It is not appropriate to ignore subsequent work when the additional work essentially shows that the candidate did not understand the demand of the question.

- **Linear equations**

  Full marks can be gained if the solution alone is given, 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.

- **Parts of questions**

  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.
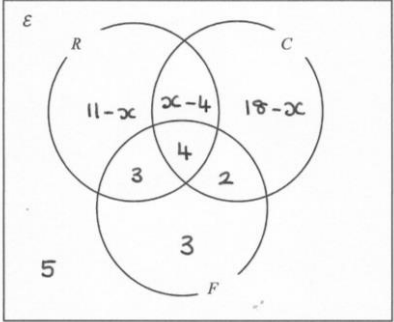
Question	Working	Answer	Mark	Notes
1 (a)		7.15 (cm)	1	B1
(b)		29.5 (cm²)	1	B1
(c)	"29.5" ÷ (0.5 × "7.15")		2	M1 "their (b)" ÷ (0.5 × "their(a)") Or their (b) = (0.5 × "their(a)") × h
		8.252		A1 cao

Question	Working	Answer	Mark	Notes
2 (a)		5, 1, −1, 11	2	B2 all correct or B1 for 2 or 3 correct
(b)	(−1,5)(0,1)(1, −1)(2, −1)(3,1)(4,5)(5,11)	Correct curve	2	B1 Completely correct curve. B1ft for at least 5 points correctly plotted and joined.
(c)		−1.25	1	B1ft from their graph but not −1 as an answer, theirs ±0.1
(d)		2.6, 0.4	1	B1 answers ±0.1
(e)	Line $y = x − 1$		3	M1 for indication that $y = x − 1$ is the graph. Allow written if incorrectly drawn but must have a straight line drawn.
		0.6, 3.4		A2 answers ±0.1 Incorrect line or no line A0A0

Question	Working	Answer	Mark	Notes
3 (a)	$270 \div (2 + 3 + 4)\ (=30)$ 30×4 	 120	3	M1 M1 A1
(b)	$270 \times 1.2(0)\ (=324)$ or $64.8(0) \div 270\ (=0.24)$ oe $324 \div 64.8(0) \times 100$ or $1.2(0) \div 0.24 \times 100$ oe 	 500%	3	M1 M1 A1
(c)	$\dfrac{8}{9} \times 270(= 240)$ or $\dfrac{1}{9} \times 270(= 30)$ $240 \times 1.2(0) + 30 \times (0.5 \times (1.20 + \dfrac{64.80}{270})) - 30 \times \dfrac{64.80}{270}$ 	 302.40	3	M1 M1 A1 allow 302.4

Question	Working	Answer	Mark	Notes
4 (a)(i)		**6b** – **6a**	1	B1 oe
(ii)		**6b** – **3a**	1	B1 oe
(iii)		**2b** − **a**	1	B1 oe
(b)	$\overrightarrow{ON} = \mu(5\mathbf{a} + 2\mathbf{b})$ or $\overrightarrow{ON} = 6\mathbf{b} + n\mathbf{a}$			M1
	$\overrightarrow{ON} = \mu(5\mathbf{a} + 2\mathbf{b})$ and $\overrightarrow{ON} = 6\mathbf{b} + n\mathbf{a}$			M1
	$n = 15$ oe.e.g. $3(5\mathbf{a} + 2\mathbf{b})$			M1
		6b + **15a**	4	A1
(c)	for sides in ratio 1 : 2 oe			M1
	$2^2 \times 12$			M1
		48	3	A1

Question	Working	Answer	Mark	Notes
5 (a)		Enlargement, scale factor 0.5, centre $(-6, 0)$	3	B1 Enlargement (not stretch) B1 scale factor 0.5 B1 centre of enlargement (-6, 0)
(b)	$\begin{pmatrix} -1 & 0 \\ -3 & -1 \end{pmatrix}\begin{pmatrix} -1 & -1 & -2 \\ 1 & 3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 2 \\ 2 & 0 & 5 \end{pmatrix}$	C correctly plotted	3	B2 for all points correctly calculated (may be in any order) B1 for 2 correctly calculated coordinates B1 for correctly plotting C
(c)	$\begin{pmatrix} 3 & -1 \\ -1 & 0 \end{pmatrix}\begin{pmatrix} 1 & 1 & 2 \\ 2 & 0 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 3 & 1 \\ -1 & -1 & -2 \end{pmatrix}$	D correctly plotted	3	B2 for all points correctly calculated (ft (b)) B1 for 2 correctly calculated coordinates B1 for correctly plotting D
(d)		Reflection in $y = x$	2	NB: If not a single transformation then B0B0 B1 reflection B1 in $y = x$ (must be true for their triangle B and triangle D)

Question	Working	Answer	Mark	Notes
6 (a)			3	B3 fully correct B2 for 6 or 7 correct entries B1 for 3, 4 or 5 correct entries Allow 4,3 and 11 instead of $11-x$, $x-4$, $18-x$.
(b)	$11-x + x - 4 + 18 - x + 3 + 4 + 2 + 3 + 5 = 35$			M1 Sum of all their 8 values = 35 or "their 3" + "their 4"
		7	2	A1
(c)(i)		19	2	B1ft
(ii)		10		B1 ft
(d)		$\dfrac{5}{14}, \dfrac{3}{9}, \dfrac{1}{5}$	2	B2 for all of $\dfrac{5}{14}, \dfrac{3}{9}, \dfrac{1}{5}$ B1 for 1 correct
(e)	$\dfrac{9}{14} \times \dfrac{6}{9} + \dfrac{5}{14} \times \dfrac{4}{5}$ oe			M1 Correct method using their prob from tree diagram DO Not ISW
		$\dfrac{5}{7}$	2	A1 oe allow 0.71 or better

Question	Working	Answer	Mark	Notes
7 (a)		The angle between a <u>radius</u> and a <u>tangent</u> is <u>90°</u>	1	B1 Oe
(b)	e.g. $\tan 27° = \dfrac{OC}{12}$ or $\tan 63° = \dfrac{12}{OC}$ $OC = 12\tan 27°$ or $OC = \dfrac{12}{\tan 63°}$ (=6.11..) $0.5 \times 12 \times 12\tan 27°$ oe	36.7 cm²	4	M1 for correct use of trig M1 correct equation for OC M1 A1 awrt 36.7 /36.8
(c)	$AOC = 126°$ or DOC and DOA both marked or stated as $63°$ for <u>angles</u> in a <u>triangle</u> total $180°$, $EOC = AOE$ as $AO = CO$, $EA = EC$ and EO is a common side and <u>angle at centre</u> is twice angle at <u>circumference</u>. oe	63° Correct reasons for their method	4	M1 0.5×126 A1 B2 (B1 for one correct reason)
(d)	$180 – $"63" or $0.5 \times (360 – 2 \times$"63")	117°	2	M1 $180 – $ their (c) A1
(e)	$\begin{array}{l\|l\|l} OCB & BAC = 59 & \text{reflex } AOC = \\ = 90 – 59 & OAC = & 360 – 2 \times \text{"63"} \\ \quad (31) & (180 – 2 \times \text{"63"}) \div 2 & \quad (=234) \\ & \quad (=27) & OCB = 90 – 59 \\ & & \quad (=31) \\ BAO = & BAO = 59 – \text{"27"} & 360 – \text{"63"} – \\ \text{"63"} – 31 & & \text{"234"} – \text{"31"} \end{array}$	32°	3	M1 1 of the angles. May be on diagram M1 A1

Question	Working	Answer	Mark	Notes
8	$2(3 + 2y)^2 + y^2 = 6$ or $2x^2 + \left(\dfrac{x-3}{2}\right)^2 = 6$			M1 for correct substitution for x or y
	e.g. $2(9 + 12y + 4y^2) + y^2 = 6$ or $2x^2 + \dfrac{x^2 - 6x + 9}{4} = 6$			M1 for correct expansion in correct equation
	e.g. $9y^2 + 24y + 12 \ (= 0)$ or $9x^2 - 6x - 15 \ (=0)$			M1 for correct 3 term quadratic dep on M1(one of the 2 above)
	$(3y + 2)(y + 2) \ (=0)$ $(3x - 5)(x + 1) \ (=0)$			M1 Solving 3 term quadratic .For correct factorising or correct use of formula or completing the square.
		$x = \dfrac{5}{3}, y = -\dfrac{2}{3}$ $x = -1, y = -2$		A1 for correct x or y values
			6	A1 for all 4 values correctly paired

Question	Working	Answer	Mark	Notes
9	eg (3×5+2×15+3.6×10+0.6×20+1.7×10) **or** (6×5+4×15+7.2×10+1.2×20+3.4×10) or (30×5+20×15+36×10+6×20+17×10) (3×5+2×15+3.6×10+0.6×20+1.7×10) [= 110] **or** (6×5+4×15+7.2×10+1.2×20+3.4×10) [=220] or (30×5+20×15+36×10+6×20+17×10) [=1100] freq of 30 – 50 bar = 20 × 2.4 [=48] or freq of 50 – 60 bar = 10 × 6.8[=68] or freq of 45 – 50 = 5 × 2.4[=12] $\dfrac{"80"}{440} \times \dfrac{"80"-1}{439}$	0.0327	5	M1 for use of area of bar, showing at least 2 products or for statement such as 44 blocks of 25 squares or 11 blocks of 100 squares. Allow 44 squares. Implied by following Method mark M1 for complete method to find total area of bars **or** for >45 = $\dfrac{8}{44}$ or $\dfrac{2}{11}$ **or** for FD scale of 1cm = FD of 2 , 0.4 [per small square] oe M1 for correct method to find frequency of 30-50 **or** 50-60 bar **or** 45 – 50 **or** for $\dfrac{8}{44} \times 440$ or $\dfrac{2}{11} \times 440$ oe M1 oe A1 0.032718989..., $\dfrac{158}{4829}$ awrt 0.0327

Question	Working	Answer	Mark	Notes
10 (a)	$8x^2 + 8xy = 240$	$8x^2 + 8xy = 240$ $x^2 + xy = 30$ $x^2 + xy - 30 = 0$	2	M1 A1 cso Completely correct rearrangement
(b)	(volume =) $4x^2y$ $y = \dfrac{30 - x^2}{x}$ (volume =) $4x^2 \times (\dfrac{30 - x^2}{x}) = 120x - 4x^3$ $\dfrac{dy}{dx} = 120 - 12x^2 = 0$	$\sqrt{10}$	5	M1 Correct volume M1 Finding y in terms of x allow 1 sign error M1 Subst y into Volume M1 Multiplying out and Differentiating one term correct A1 Must be exact

Question	Working	Answer	Mark	Notes
11 (a)		$\dfrac{25}{3}$	1	B1 oe
(b)		50	1	B1
(c)	$\dfrac{x}{3x-25}=7$ and $7(3x-25)=x$ e.g. $21x-x=175$ 	 8.75	 3	M1 for $h=7$ and for getting rid of denominator M1 collecting terms in x on one side and number terms the other in correct equation A1 oe
(d)	$g(4)=11$ 1.375	 	 2	M1 $hg(x)=\dfrac{2x+3}{3(2x+3)-25}$ A1 oe
(e)	$y(3x-25)=x$ or $x(3y-25)=y$ $3xy-x=25y$ or $3xy-y=25x$ oe	 $h^{-1}:x\mapsto\dfrac{25x}{3x-1}$	 3	M1 for $y=$ or $x=$ and first stage of rearrangement. M1 for collecting terms in x or y (as appropriate) on the same side. A1 $\dfrac{25x}{3x-1}$
(f)	$[fg(x)=]\ (2x+3)^2+3(2x+3)-4$ $4x^2+18x+14\ (=0)$ oe $2(2x+7)(x+1)\ (=0)$ $-3.5,-1$		 4	M1 $fg(x)$ correct or $x^2+3x-4=0$ oe M1 Allow for $g(x)=1$ or $g(x)=-4$ M1 a correct method to solve their quad or for $2x+3=1$ and $2x+3=-4$ A1 both answers