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Mark Scheme (Results)

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Pearson Edexcel International GCSE
Mathematics B (4MB0)
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

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- **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 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 it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.
  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
  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 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.
  If there is no answer on the answer line then check the working for an obvious answer.

- **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 eg algebra.
  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Parts of questions**
  Unless allowed by the mark scheme, the marks allocated to one part ofthe question CANNOT be awarded in another.

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Question	Working	Answer	Mark	Notes
1.	$\sqrt{40^2+9^2}$			M1
		(slant height =) 41		A1
	"41"$\times 9\times\pi+9\times 9\times\pi$			M1 DEP
		450π (c.c.)	4	A1
				Total 4 marks

Question	Working	Answer	Mark	Notes
2. (a)		-1.75, $-\frac{7}{4}$	1	B1
(b)	$(3-2x)^2+6(3-2x)+1$			M1
		$\text{fg}: x\mapsto 4x^2-24x+28$	2	A1
(c)	"$4x^2-24x+28$"$-56=0$			M1
	Attempt to factorise trinomial quadratic			M1 DEP
		7, -1	3	A1
				Total 6 marks

Question	Working	Answer	Mark	Notes
3.	Heights with correct widths	12		B1
		14		B1
		5		B1
		1	4	B1
	Deduct 1st B for any gaps			**Total 4 marks**

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Question	Working	Answer	Mark	Notes
4. (a)		10, 45 and 8		B1
		$25 - x$, $13 - x$	2	B1
(b)		c's six terms = 90	1	B1 ft
(c)		11 cao and correctly obatined	1	B1
(d)(i)		35 cao		B1
(d)(ii)		$66 - "11"$ (55) OR $90 - "35"$	2	B1 ft
				Total 6 marks

Question	Working	Answer	Mark	Notes
5. (a)		$\frac{60}{x}$	1	B1
(b)		$\frac{60}{x+6}$	1	B1
(c)		$"\frac{60}{x} - \frac{60}{x+6}" = \frac{1}{2}$ (oe)	1	B1 ft
(d)	Correctly removing c's three denominators			M1
		$x^2 + 6x - 720$ $(= 0)$		A1
	Attempting to solve c's trinomial quadratic equation			M1
		$x = 24$	4	A1 cao
				Total 7 marks

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Question	Working	Answer	Mark	Notes
6. (a)		120, 96, 48, 24	2	B2 (-1 eeoo)
(b)		$\frac{"120"}{360}$ (oe)	1	B1 ft
(c)	$\frac{72+"48"+"24"}{360}$ **OR** $1-\left(\frac{"120"}{360}+\frac{"96"}{360}\right)$			M1
		$\frac{2}{5}$ (oe)	2	A1
(d)	$\frac{72}{360}\times\frac{"120"}{360}+\frac{"120"}{360}\times\frac{72}{360}+\frac{"96"}{360}\times\frac{"96"}{360}$ ie *2 correct probabilities added*		3	M1
	$\frac{72}{360}\times\frac{"120"}{360}+\frac{"120"}{360}\times\frac{72}{360}+\frac{"96"}{360}\times\frac{"96"}{360}$			M1 DEP
		0.204 $\left(\frac{46}{225}\right)$		A1
				Total 8 marks

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Question	Working	Answer	Mark	Notes
7.				**Penalise ncc once only in this question**
(a)	$(AC^2) = 25^2 + 19^2 - 2\times25\times19\times\cos110$			M1
	$AC = \sqrt{(625+361-950\cos110)}$			M1 DEP
		36.2	3	A1
(b)	$\frac{25}{\sin BDA} = \frac{32}{\sin110}$			M1
	$\angle BDA = \sin^{-1}\left(\frac{25\times\sin110}{32}\right)$			M1 DEP
		47.2°	3	A1
(c)	$\angle BAD = 180-110-"47.2"$			B1 ft
	$\frac{1}{2}\times25\times32\times\sin"22.8"$			M1
		155 (cm^2)	3	A1
				Total 9 marks

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Question	Working	Answer	Mark	Notes
8. (a)(i)		$\mathbf{a} + \frac{1}{2}\mathbf{b}$		B1
(a)(ii)		$\frac{1}{4}\mathbf{b} - \mathbf{a}$	2	B1
(b)		$\lambda(\text{"}\mathbf{a} + \frac{1}{2}\mathbf{b}\text{"})$	1	B1 ft
(c)		$\mathbf{a} + \mu(\text{"}\frac{1}{4}\mathbf{b} - \mathbf{a}\text{"})$ (oe)	1	B1 ft
(d)	Equating one set of components			M1
		$\lambda = \frac{1}{3}, \quad \mu = \frac{2}{3}$ (cao)	3	A1 A1
(e)	$\sqrt{3^2 + 4^2}$			M1
		5	2	A1
(f)	$OE = \sqrt{4^2 + 6^2}$ (= 7.21)			M1
	$XE = (1 - \text{"}\frac{1}{3}\text{"}) \times OE$			M1 DEP
	OR $\overrightarrow{XE} = \left(1 - \text{"}\frac{1}{3}\text{"}\right)\overrightarrow{OE} = \frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$			(M1)

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	$\left\|\overrightarrow{XE}\right\| = \sqrt{\left(\left(\frac{2}{3}\times 4\right)^2 + \left(\frac{1}{3}\times 12\right)^2\right)}$			(M1 DEP)
		4.807… conclusion	3	A1 Accept $\frac{2}{3}\sqrt{52}$
				Total 12 marks

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Question	Working	Answer	Mark	Notes
	Penalise ncc ONCE only in question			
9. (a)		8		B1
		8.3		B1
		18.2	3	B1
(b)	**-1 mark for**: any straight line segments each point missed (± ½ small square) each missed segment each point incorrectly plotted (± ½ small square) tramlines very poor curve		3	B3 (-1 eeoo)
(c)	"Tangent" (ie straight line) drawn at (4, 12)			M1
		5(±0.3)	2	A1
(d)	straight line passing through (0, 20) or (5, 0)			B1
	straight line passing through (0, 20) and (5, 0)		2	B1 (tolerance ±1 ss. Line does not have to pass through either point but would pass if extended)
(e)	$x^3 - 2x^2 + 16 = 20x - 4x^2$			M1
		cc	2	A1
(f)		0.9 (± 0.1)		B1 ft
		2.9 (± 0.1)	2	B1 ft
				Total 14 marks

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Question	Working	Answer	Mark	Notes
	Penalise labelling ONCE only			
10. (a)	Triangle *A*		1	B1
(b)	$y = -1$		1	B1
(c)	Triangle *B*		1	B1
(d)	Either point (0, -2) indicated **OR** At least two construction lines through (0, -2)			M1
	Triangle C		3	A2 ft (-1ee)
(e)	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$"$\begin{pmatrix} -1 & -2 & -3 \\ -1 & -1 & 1 \end{pmatrix}$"			M1
	$\begin{pmatrix} 1 & 2 & 3 \\ -1 & -1 & 1 \end{pmatrix}$			A1 ft
	Triangle D		3	A1 ft
(f)		Reflection		B1
		$x = 0$ **OR** y-axis	2	B1
(g)		Englargement		B1
		Scale factor 2		B1
		Center (0, -4)	3	B1
				Total 14 marks

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Question	Working	Answer	Mark	Notes
11. (a)	factor of t			M1
	$(2t-5)(t-4)$			M1
		$t(2t-5)(t-4)$	3	A1
	SC: $(2t^2-5)(t-4)$ OR $(2t-5)(t^2-4)$ (M2)			
(b)		$t = 2.5,\ \frac{5}{2}$		B1 ft
		$t = 4$	2	B1 ft **SC:** No factorising quadratic in (a): A correct attempt to solve their quadratic from (a) earns B1B0 Method should be seen – no ft
(c)	One term correctly differentiated			M1
	Two terms correctly differentiated			M1 DEP
		$12t^2-52t+40$	3	A1
(d)		$"12t^2-52t+40"=0$		B1 ft
	Attempt to factorise c's quadratic			M1
		$t=\frac{10}{3},\quad t=1$	4	A1, A1
(e)	One term correctly differentiated			M1
		$24t-52$		A1
	$"24"\times 3-"52"$			M1 DEP
		20 m/s^2 (cao)	4	A1
				Total 16 marks

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