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Mark Scheme (Results)

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Pearson Edexcel International GCSE Mathematics B (4MB0/02R) Paper 2R

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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.
- 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.

- **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 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.

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- **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.

- **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.

- **Parts of questions**

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

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Question Number	Answer	Notes	Mark
1	seeing either $\pi 26^2$ or $\pi 24^2$	B1	
	$\pi(26^2 - 24^2)$	M1	
	$\pi(26^2 - 24^2) \times 4$	M1dep	
	1260 mm^3	A1	4
		Total 4 marks	

Question Number	Answer	Notes	Mark
2(a)	$\frac{5}{2} \times 6186$	M1	
	15465	A1	2
(b)	4×6186 (o.e.)	M1	
	24744	A1	2
(c)	$"24744" \times \frac{4}{3}$	M1	
	32992	A1	2
		Total 6 marks	

Question Number	Answer	Notes	Mark
3(a)	$8 - 16 + 2p + q = 0$	B1	1
(b)	$-27 - 36 - 3p + q = 0$	B1	1
(c)	correct method to eliminate q (or p)	M1	
	$p = -11$, $q = 30$	A1,A1	3
		Total 5 marks	

Question Number	Answer	Notes	Mark
4(a)	50° (∠ at centre)	B1,B1	2
(b)	65° (isosceles triangle)	B1ft,B1	2
(c)	35° (opposite angles of cyclic quad)	B1ft,B1	2
	(accept ∠ at centre and isosceles triangle again)		
		Total 6 marks	

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Question Number	Answer	Notes	Mark
5(a)	$\frac{232}{360}\times 1800000$	M1	
	£ 1 160 000	A1	2
(b)	$\frac{17.5}{360}\times 100$	M1	
	$360-(232+44+"63")$	A1ft	
	$\frac{"21"}{360}\times 100$	M1dep	
	5.83%	A1	4
	OR $\frac{232+44}{360}\times 100$	M1,A1	
	+ 17.5%	M1 dep	
	5.83%	A1	
		Total 6 marks	

Question Number	Answer	Notes	Mark
6	*Penalise unrounded answers only once in the question*		
(a)	correctly substituted cosine formula	M1	
	$\cos \angle BDA = \frac{8^2+4^2-11^2}{2\times 4\times 8}$ (o.e.)	A1	
	$\angle BDA = 129.8.....$	A1	
	$\angle BDC = 50.2°$	A1ft	4
(b)	$\frac{8}{\sin \angle BCD} = \frac{9}{\sin "50.2"}$	M1,A1	
	$\angle BCD = 43.0°$ (accept 43.1°)	A1	3
(c)	"50.2"+"43.1"	M1	
	$\frac{1}{2}\times 8\times 9\times \sin[180-("50.2"+"43.1")]$	M1dep	
	35.9 cm^2	A1	3
		Total 10 marks	

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Question Number	Answer	Notes	Mark
7(a)	3	B1	
	22	B1	
	15, 11 and 6	B1	3
(b)	$22+"15"+8+"11"+3+"6"+x+2x=80$	M1	1
(c)	$3x + 65 = 80$	M1	
	$x = 5$	A1	2
(d)	Swimming	B1	1
(e)(i)	39	B1 ft	
(ii)	34	B1 ft	2
(f)	numerator 8	B1	
	denominator 39	B1 ft	2
		Total 11 marks	

Question Number	Answer	Notes	Mark
8	penalise incorrect/missing labels once only		
(a)	triangle ABC	B1	1
(b)	$\begin{pmatrix} -4 & -5 & -4 \\ 3 & 1 & 1 \end{pmatrix}$	B2 (-1ee)	2
(c)	triangle $A'B'C'$	B2ft (-1ee)	2
(d)	reflection, $y = -x$	M1,A1	2
(e)	one vertex correctly identified	B1	
	triangle $A''B''C''$ correct	B1	2
(f)	reflection, $y = x + 3$	M1,A1	2
		Total 11 marks	

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Question Number	Answer	Notes	Mark
9(a)	$\frac{4}{9}$	B1	
	$\frac{4}{5}, \frac{1}{5}$	B1	
	$\frac{3}{6}, \frac{3}{6}$	B1	3
(b)	$\frac{5}{9}\times\frac{4}{5}+\frac{4}{9}\times\frac{3}{6}$	M1,M1	
	$\frac{2}{3}$	A1	
	$1-"\frac{2}{3}"$ (o.e.)	M1	
	conclusion	A1	5
(c)	numerator: $"\frac{4}{9}"\times"\frac{3}{6}"$	M1	
	denominator: $"\frac{4}{9}"\times"\frac{3}{6}"+"\frac{5}{9}"\times"\frac{4}{5}"$	M1	
	$\frac{1}{3}$	A1	3
		Total 11 marks	

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Question Number	Answer	Notes	Mark
10(a)(i)	$\mathbf{b}-\mathbf{a}$	B1	
(ii)	$-\mathbf{b}$	B1	
(iii)	$\mathbf{a}+\frac{1}{2}(\mathbf{b}-\mathbf{a})$	M1	
	$\frac{1}{2}(\mathbf{a+b})$	A1	
(iv)	$\mathbf{b}+\frac{1}{2}(\mathbf{a+b})$	M1	
	$\frac{3}{2}\mathbf{b}+\frac{1}{2}\mathbf{a}$	A1	6
(b)	$-\mathbf{b}+\mu("\frac{1}{2}\mathbf{a}+\frac{3}{2}\mathbf{b}")$	M1	
	correct conclusion (no wrong working seen)	A1	2
(c)	$(\frac{3}{2}\mu-1)=0$	M1	
	$\mu=\frac{2}{3}$	A1	
	$\lambda=\frac{1}{2}\mu$	M1	
	$\lambda=\frac{1}{3}$	A1	4
(d)	area of ENO = $\frac{1}{2}\times\frac{1}{3}\times$ area of $EFAO$	M1	
	= $\frac{1}{6}\times\frac{1}{3}\times$ area of hexagon	M1 dep	
	108	A1	3
		Total 15 marks	

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Question Number	Answer	Notes	Mark
11(a)	23.9, −5, -2	B1,B1,B1	3
(b)	graph penalties		
	-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	B1,B1,B1	3
(c)	tangent drawn at correct location	M1	
	$\frac{\text{increase in } y}{\text{increase in } x}$	M1	
	Accept answer in range -22 to -29	A1	3
	Final answer dependent on both method marks Do NOT accept calculus		
(d)	$y = -15$ drawn	M1	
	2.4	A1	2
(e)	correct straight line drawn	B1	1
(f)	identifying **all** values of x for c's intersections	B1ft	
	one correct range statement (from c's values)	B1ft	
	a second correct range statement (from c's values)	B1ft	3
		Total 15 marks	

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