Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE
In Mathematics B (4MB0)
Paper 01R

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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.

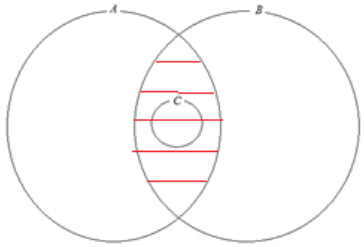
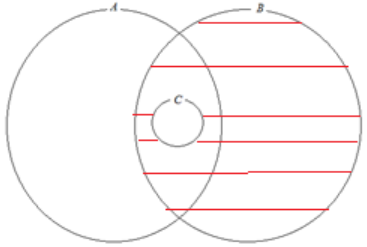
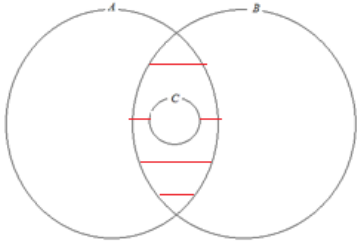
  Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are 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 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.
  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 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: 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.
- **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	190×0.454	86.26	2	M1 implied by a correct answer A1 awrt 86.3Allow if correct answer in working but rounded off on answer line
2	$BC = \sqrt{50^2 - 25^2}$ or $\sqrt{1875}$	43.3	2	M1 implied by correct answer Allow for BC = 50 cos 30° or 25 tan 60° Implied by $25\sqrt{3}$ A1 awrt 43.3 Do **not** allow answer of $25\sqrt{3}$
3	either $3a^2b^5$ (3 term expression in a and b) or correct partial factorisation eg $3a^2\left(a^3b^5 - 2ab^6 + 5b^7\right)$ or $3b^5\left(a^5 - 2a^3b + 5a^2b^2\right)$	$3a^2b^5\left(a^3 - 2ab + 5b^2\right)$	2	M1 partial correct factorisation where the common factor contains at least 2 different terms taken out (eg 3a, 3b, ab or ab^2) A1
4 (a)		0.086	1	B1
(b)		0.0856	1	B1
5	n(B) = n$\left(A \cup B\right)$ + n$\left(A \cap B\right)$ − n(A) = 60 + 17 – 42	35	2	M1 Allow Venn Diagram or working showing *clear evidence* that n$\left(A' \cap B\right) = 18$ (M1) Must check working. 18 with no working or incorrect working M0 A1

Question	Working	Answer	Mark	Notes
6	$42 = 2\times3\times7$ $\quad 6\times7$ $60 = 2^2\times3\times5$ OR $6\times2\times5$ } (2 of) $66 = 2\times3\times11$ $\quad 6\times11$ OR 2 correct Factor Trees OR 2 | 42 60 66 3 | 21 30 33 7 10 11	4620	2	M1 Implied by correct answer Allow if they then find HCF in error A1
7	$\$338\times\frac{100}{65}$ (oe)	520	2	M1 alternative method $x - 0.35x = 338$ oe. Implied by correct answer A1
8		28 -11	2	B1 B1

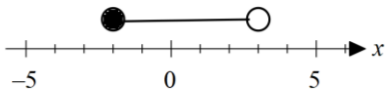
Question	Working	Answer	Mark	Notes
9	$\tan 35^\circ = \frac{65}{BC}$ (oe) BC =92.83	92.8	2	M1 Alternative methods $\tan 55^\circ = \frac{BC}{65}$ **or** $\frac{a}{\sin 55^\circ} = \frac{65}{\sin 35^\circ}$ A1 awrt 92.8/92.9 **SC** $\tan 35^\circ = \frac{BC}{65}$ B1 where $\angle BAC$ is marked as 35 on the diagram.
10	Use of $\sqrt{\left(\frac{324}{441}\right)}$ or $\sqrt{\left(\frac{441}{324}\right)}$ (oe) $h_B = 9 \times \sqrt{\left(\frac{441}{324}\right)}$ (oe)	awrt 10.5(cm)	3	B1 must have the square root at some point. Eg 6:7, 7:6, 21:18. 18:21 M1 Fully correct method A1
11	$abd = b^2cd - b^2 + a$ $a(bd-1) = b^2cd - b^2$	$a = \frac{b^2(cd-1)}{(bd-1)}$ oe	3	Remove denominator M1 Allow $abd = b^2cd - b^2 \pm a$ or $a^2bd = ab^2cd - ab^2 \pm a^2$ M1 dep on 1st M1 Collecting terms in a and taking out a as a common factor Allow 2 sign errors only A1 (oe) eg $\frac{bc - \frac{b^2}{bd}}{1 - \frac{1}{bd}}$

Question	Working Answer	Mark	Notes
12 (a)		1	B1 *C* must be shaded
(b)		1	B1 *C* must not be shaded
(c)		1	B1 *C* must not be shaded. **NB: (a), (b) & (c):** The required region must be shaded. If more than one type of shading is used, then the required region by the question must be identified.

<table>
<tr><th>Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>13</td><td>$6^3 - \pi\left(\frac{4}{2}\right)^2 \times 6 \left[= 216 - 24\pi\right]$ (oe)
$\frac{6^3 - \pi\left(\frac{4}{2}\right)^2 \times 6}{6^3}$ (oe)</td><td>$\left(1 - \frac{\pi}{9}\right)$, $\frac{9-\pi}{9}$</td><td>3</td><td>M1 allow awrt 141
M1 dep on 1st M1 allow awrt 0.651
A1 Allow $1 - 0.11\pi$ (or better)
ISW if have correct answer in working
NB awrt 0.651 with no working gets M1M1A0</td></tr>
<tr><td>14</td><td>
<table>
<tr><td>Method 1</td><td>Method 2</td><td>Method 3</td></tr>
<tr><td>$\angle ACD = 70^o$
(Alt. Seg. Th.)</td><td>$\angle BAD = 80^o$
(Cyclic Quad.)
$\therefore \angle PAB = 30^o$
($\angle$s on str. line)</td><td>$\angle ACD = 70^o$
(Alt. Seg. Th.)</td></tr>
<tr><td>$\therefore \angle BCA = 30^o$
(Alt. Seg. Th.)</td><td>$\therefore \angle BCA = 30^o$
(Alt. Seg. Th.)</td><td>$\therefore \angle ADC = 70^o$
(Cyclic Quad.)
$\therefore \angle CAD = 40^o$
($\angle$s of Δ)</td></tr>
<tr><td>$\therefore \angle BAC = 40^o$
($\angle$s of Δ)</td><td>$\therefore \angle BAC = 40^o$
($\angle$s of Δ)</td><td>$\therefore \angle BAC = 40^o$
(Cyclic Quad.)</td></tr>
<tr><td colspan="3">Alternate Seg Theorem and $\angle s$ of Δ / Triangle = 180
or angles in same segment</td></tr>
</table>
</td><td>40</td><td>4</td><td>B1 Allow if angles given on diagram
B1 Allow if angles given on diagram
B1 Do not award if from incorrect working eg 80/2
NB the above B marks are for the angles
B1</td></tr>
</table>

Question	Working	Answer	Mark	Notes
15	$47.5 \le t < 48.0:\ FD = 8 \quad \therefore 8 = \alpha \dfrac{20}{0.5} \quad \alpha = 0.2$ or Area representing frequency: $20 = \alpha(0.5 \times 8) \quad \therefore \ \alpha = 5$			
	$46.0 \le t < 46.5$: *FD* = 4 units , bar drawn	4 units		B1 **NB:** "unit" = 1 cm
	$46.5 \le t < 47.5$: 15 athletes	15		B1
	$48.0 \le t < 50.0$: 20 athletes	20		B1
	FD = 3 units, bar drawn	3 units		B1ft ft their "15"
			4	SC if no marks awarded B1 for a correct frequency density eg 8 (allow as a scale)
16 (a)	$4 \times 6 = 10 \times XC$			M1
		2.4	2	A1
(b)	Area of $\Delta AXB = \dfrac{1}{2} \times 10 \times 6 \times \sin 60$			M1 implied by $15\sqrt{3}$
		26	2	A1 Accept 26.0

Question	Working	Answer	Mark	Notes
17	Making coef of x or y the same in both eqns OR isolating x or y			M1 Allow one error in multiplication or 1 sign error.
	$6x+27y=24$ $6x+4y=2$ | $4x+18y=16$ $27x+18y=9$ | **A1**			
	Subtract or adding eqn^s OR subst expression for x or y leading to a value for y or x			M1 dependent on 1st M mark **NB:** Allow a total of 1 slip in both M marks.
		$-\frac{7}{23}$, awrt -0.30		A1 Dep on first M1
		$\frac{22}{23}$, awrt 0.96	4	M1 Dep on first M1
18 (a)	$544(2x-5)=408x$ (oe)	4	2	M1 a correct equation
				A1 ft their value of x from (a) $\frac{544\times(5+"x"+2"x"-5")}{"x"}$
(b)	Total number of journeys = $\frac{544\times(5+"4"+"3")}{"4"}$ OR $\frac{5\times544}{"4"}+544+408$ or $\frac{5\times408}{"3"}+544+408$			M1 or $\frac{5\times544}{"x"}+544+408$ or $\frac{5\times408}{"2x-5"}+544+408$
		1632	2	A1 (cao)

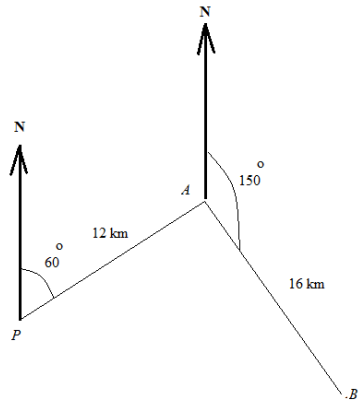
Question	Working	Answer	Mark	Notes
19 (a)	Arc, centred *C*, radius 5 cm, drawn within *ABCD*		1	B1
(b)	Arcs having the same radius, centred *A* and *D* (or *B* and *C*) intersecting on both sides of *AD* (or *BC*) OR Two sets of arcs, each set having the same radius, centred *A* and *D* (or *B* and *C*) intersecting within *ABCD*			M1
	Lines joining points of intersecting drawn within *ABCD*		2	A1
(c)	*R* shaded and labelled		1	B1 Condone missing *R*
20 (a)	$-10 \le 5x$ OR $5x < 15$			M1 either
	$-10 \le 5x$ and $5x < 15$			(dep) both
		$x \ge -2$		M1
		$x < 3$		NB $-2 \le x < 3$ will gain both A marks
				A1 NB **SC** If there is a list of numbers on the answer line mark the inequalities in the working and then knock off the last A mark awarded.
			4	A1
(b)				B1 ft their answer to part(a) no need for numbers to be marked. A single line between the circles.
			1	B1

Question	Working	Answer	Mark	Notes
21 (a)	Rearrangement of the 12 weights in ascending (descending) order (allow 1 slip/omission) and $\frac{24+25}{2}$ (seen or implied by answer)	24.5	2	M1 if numbers not rearranged the answer is 23.5 and gains M0A0 A1 (cao)
(b)	$\frac{\Sigma \text{ masses } (=291)}{12}$	24.25	2	M1 Allow for (1 missing value /error) in the sum A1 (cao)
(c)		2/3 (oe)	1	B1 awrt 0.67/ 67% or better No need for fraction to be simplified eg $\frac{8}{12}$
22	$\frac{75^{3n}\times 3^{2n^2-10n}\times 5^{2-6n}}{45^2}=3^y$ $\frac{3^{3n}\times 5^{6n}\times 3^{2n^2-10n}\times 5^2\times 5^{-6n}}{45^2}=3^y$ $\frac{3^{3n}\times 5^{6n}\times 3^{2n^2-10n}\times 5^2\times 5^{-6n}}{3^4\times 5^2}=3^y$ $\frac{3^{3n}3^{2n^2-10n}}{3^4}=3^y$ $\therefore\ y=2n^2-7n-4$ *		5	M1 $3^{2\left(n^2-5n\right)}=3^{2n^2-10n}$ **or** $5^{2(1-3n)}=5^{2-6n}$ M1 Rewrite 75^{3n} as $3^{3n}\times 5^{6n}$ or $(3*5*5)^{3n}$ and $5^{2(1-3n)}=5^2\times 5^{-6n}$ Rewrite 45^2 as $3^4\times 5^2$ M1 **NB:** Above 3 M1s can be implied by correct working M1 Dependent on all 3 previous M marks. Elimination of factors of 5 A1 cso Fully correct solution with no errors.

Question	Working	Answer	Mark	Notes
23 (a)	$(1-x)^2 = 4\pi x^2$		M1	must be in part(a) NB M0 if have $\frac{4}{3}\pi r^2$ and then multiply by 3
		$x^2(4\pi-1)+2x-1=0$	A1*	cso
(b)	$x = \frac{-2\pm\sqrt{(2)^2-4\times(4\pi-1)\times(-1)}}{2(4\pi-1)}$		M1	correct method for solving a quadratic Allow $x = \frac{-2\pm\sqrt{16\pi}}{2(4\pi-1)}$ oe
	$= \frac{-2\pm 4\sqrt{\pi}}{2(4\pi-1)}$		dM1	(dep) for simplifying $\sqrt{16\pi}$ in the fraction
		$\therefore x = \frac{2\sqrt{\pi}-1}{4\pi-1}$ AND since $x > 0$	A1	(oe) must be fully simplified allow a length > 0 for reason **NB** no marks for finding π in terms of x
24	$3-4x$ as the (1,2) element of $3\mathbf{A}-2\mathbf{B}$		B1	
	$3x-4y$ as the (2,2) element of $3\mathbf{A}-2\mathbf{B}$		B1	For equating (1,2) component of their $3\mathbf{A}-2\mathbf{B}$ containing x to –5(allow 5) If go straight to equation allow 1 sign error in $3-4x=-5$
	$"3-4x" = -5$		M1	
		$x = 2$	A1	Dep on M1 For substituting their value of x into their 2nd equation containing x **and** y.
	$"3\times"2"-4y" = 26$		dM1	
		$y = -5$	A1	
			6	

Question		Working	Answer	Mark	Notes
25	(a)	$\frac{2x^2\left(10x^2+13x-3\right)}{x\left(5x-1\right)}$ or $\frac{2x\left(10x^2+13x-3\right)}{\left(5x-1\right)}$ $\frac{x^2\left(20x^2+26x-6\right)}{x\left(5x-1\right)}$ or $\frac{x\left(20x^2+26x-6\right)}{\left(5x-1\right)}$			M1 extracting a common factor of x^2 on the numerator **and** x on the denominator correctly. Or attempt at a long division dividing by $5x-1$ or $5x^2-x$ leading to $4x^2+...$
		$\left("10x^2+13x-3"=\right)$ $\left(5x-1\right)\left(2x+3\right)$ (oe)			M1 For factorising any 3 term quadratic which when expanded, the result gives at least 2 of the 3 terms from their trinomial. long division leading to $4x^2+...$ $4x^3+...$ A1 allow $\left(10x-2\right)\left(2x+3\right)$ or $\left(5x-1\right)\left(4x+6\right)$ long div leading to $4x^2+6x$ or $4x^3+6x^2$
			$2x\left(2x+3\right)$ oe	4	A1
	(b)	$\frac{\mathrm{d}\left("4x^2+8x"\right)}{\mathrm{d}x}$			M1 "one term" correct for differentiating their polynomial in (a)
			$8x+6$	2	A1ft ft a polynomial with 2 or more terms

Question		Working	Answer	Mark	Notes	
26	(a)		$v = 7 - 4t$	1	B1	Condone missing v
	(b)	$v = "7 - 4t" = 0$			M1	Their part(a) = 0
			$\frac{7}{4}$ or 1.75	2	A1	
	(c)		$\frac{81}{8}$, 10.125	1	B1	awrt 10.1
	(d)	$s("1.75") - s(0)$ $["10.125" - 4]$ | $s("1.75") - s(4)$ $["10.125" - 0]$ | $2 \times "\frac{81}{8}"$ $[= 20.25]$			M1	Any correct method using their part(b) – working must be shown if (b) incorrect
		distance = s("1.75") – s(0) + s("1.75") – s(4) = "10.125" – 4 + "10.125" – 0				
		or distance = $2 \times "\frac{81}{8}" - 4$			dM1	dependent on previous M mark being awarded. Correct method to find the total distance using their part (b)
			$\frac{65}{4}$ or 16.25 or awrt 16.3	3	A1	

Question	Working	Answer	Mark		Notes
27 (a)					
	60^o bearing correctly shown (P and labelled A)			B1	
	150^o bearing correctly shown (A and B labelled)			B1	
	Both distances labelled with AB = 16 km (P, A and B labelled		3	B1	
(b)	$\angle PAB = 90$			B1	may be on diagram
	$\angle ABP = \tan^{-1}\left(\frac{12}{16}\right) \quad \left(=36.87^o\right)$ OR			M1	Allow $\angle ABP = \frac{12\times\sin(90)}{\sqrt{16^2+12^2}} \quad \left(=36.87^o\right)$ etc
	$\angle APB = \tan^{-1}\left(\frac{16}{12}\right) \quad \left(=53.13^o\right)$				
	Bearing = 360 – (30 + "36.87") or Bearing = 180 + 60 + "53.13"			M1	Dep on previous M mark being awarded
		293	4	A1	awrt 293