Mark Scheme (Results)

Summer 2018

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.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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: 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	Time difference between London and Delhi is + 4hours 30 mins (oe)	2	M1
	OR For Delhi, 10 15 am to 2 12 pm is 3 hours 57 min		A1
	Time in London is 5 45am or 05 45 (cao)		
	NB: 5 45 scores A0		
	SC: 5 45 with no working gains M1		
2	One of 180 and 324 factored as $$180 = 2^2 \times 3^2 \times 5 \qquad 180 = 36 \times 5 \qquad 180 = 5 \times 3 \times 12$$ $$324 = 2^2 \times 3^4 \qquad \text{OR} \qquad 324 = 36 \times 9 \qquad \text{OR} \qquad 324 = 9 \times 3 \times 12$$ OR one correct Factor Tree	2	M1
	HCF = 36		A1
3	One term correct	2	M1
	$$\frac{dy}{dx} = 6x + 5x^{-6} \qquad \text{OR} \qquad 6x + \frac{5}{x^6}$$		A1
4	-9 , 3	2	B1
			B1

Question	Working Answer	Mark	Notes
5	1.23×10^{2} (OR 123), $\quad \dfrac{9\pi}{3\pi}$ (OR $\dfrac{9}{3}$ or 3), $\quad \left(\sqrt{3} \times \sqrt{27}\right)$ (OR $+9$ or $\sqrt{81}$) **NB:** Deduct marks starting with the **second** ePEN mark box If **one** error then B1 B0, if **two** errors B0 B0	2	B2(-1eeoo)

Question	Working Answer	Mark	Notes
6	The point X is st $CX \parallel AB \parallel ED$ $\angle BCD = \angle BCX + \angle DCX = 25 + 80$	2	M1
	$\Big($ OR Join A to E st angles BAE and DEA 90° and since sum of angles of pentagon = 540°, $540 = 90 + 90 + 155 + 100 + \angle BCD$		(M1)
	OR Straight line XCY is perpendicular to AB and ED. So $\angle XCB = 65^{\circ}$ and $\angle YCD = 10^{\circ}$ $\angle BCD = 180 - (65 + 10)$ **OR** Draw line CP st $CP \parallel AB \parallel DE$ st		((M1))
	$\angle BCD = 360 - 155 - 100$ (angles at a point) **OR** Angles at a point		((M1))
	$360 - (100 + 155)$ OR ΔBCD method: In $ABDE$: $360 = 180 - (\angle ABD + \angle BDE)$. In ΔBCD: AND in ΔBCD: $\angle BCD = 180 - \{(155 - \angle ABD) + (100 - \angle BDE)\}$		((M1)) ((M1))
	$\angle BCD = 105^{\circ}$ **NB:** Award for angles on diagram		A1

Question	Working Answer	Mark	Notes
7	Correct determinant statement $= 4 \times 6 - \left(8 \times (-2)\right)$ $\quad (= 40)$ (No errors)	2	M1
	$\dfrac{1}{40}\begin{pmatrix} 6 & 2 \\ -8 & 4 \end{pmatrix}, \quad \dfrac{1}{20}\begin{pmatrix} 3 & 1 \\ -4 & 2 \end{pmatrix}, \quad \begin{pmatrix} \frac{3}{20} & \frac{1}{20} \\ -\frac{1}{5} & \frac{1}{10} \end{pmatrix}$ (oe), $\quad \begin{pmatrix} 0.15 & 0.05 \\ -0.2 & 0.1 \end{pmatrix}$		A1
8	$\tan 30 = \dfrac{(500-350)}{AC} \quad$ OR $\quad \tan 60 = \dfrac{AC}{(500-350)} \quad$ (oe)	2	M1
	OR $\left(BD = \dfrac{150}{\sin 30} = 300\right) \quad AC = \sqrt{300^2 - 150^2} \quad$ M1		
	$AC = 260$ (m)		A1
9	$16a^5 \quad$ OR $\quad 16b^{-2}$ (oe) $\quad$ OR $\quad na^5b^{-2} \quad$ (oe, $n \neq 16$) (ie obtain 2 out of the 3 resulting factors of the answer)	2	B1
	$\dfrac{16a^5}{b^2} \quad$ OR $\quad 16a^5b^{-2}$ **NB:** Note order of marks in ePEN		B1
10	$\left(1+2^5\right) \times 2^n$ (ie odd number × even number)	2	M1
	$33 \times 2^{35} \quad$ OR $\quad m = 33$ or $1+2^5$ and $n = 35$ **NB:** No working seen scores M0 A0		A1

Question	Working Answer	Mark	Notes
11	Length of other side of the base is 6 m	3	B1
	Volume of the pyramid $= \frac{1}{3} \times ("6" \times 8) \times 15$		M1
	NB: Accept 8 or 28 as misread for 6 if there is no indication of other side eg on diagram (M1). But score M0 if any other number is used in place of 6.		
	240 m^3		A1
12	$(1 - 2x)y = 1 + x + 2(1 - 2x)$ (oe, Removing denominator, , allow 1 sign or arithmetic slip)	3	M1
	$2xy - 3x = y - 3$ (oe, correctly collecting terms in x for their expression)		M1 (DEP)
	$x = \dfrac{y-3}{2y-3}$, $\dfrac{3-y}{3-2y}$ (oe)		A1

Question	Working Answer	Mark	Notes
13	$\dfrac{a}{b} = \dfrac{3}{8}$ and $\dfrac{a}{c} = \dfrac{6}{11}$ **OR** $\qquad a:b = 6:16$ and $a:c = 6:11$	3	M1
	$\dfrac{b}{a} \times \dfrac{a}{c} = \dfrac{48}{33}$ (oe) **OR** $\qquad a: \quad b: \quad c:$		
	6 16		M1(DEP)
	6 11		
	$b : c = 16 : 11$		A1
14	$5^2 = (BC + 4) \times 4$ (oe using BD in place of BC +4)	3	M1
	$BC = \dfrac{9}{4}$, 2.25 $\qquad \dfrac{25}{4} - 4$ (if using BD)		A1
	$\Big($ OR in ΔOAD $(r + 4)^2 = r^2 + 5^2$		(M1)
	$8r + 16 = 25$ (oe) $\Big)$		(A1)
	Radius $= \dfrac{9}{8}$, 1.125 (awrt 1.13)		A1
15	$x \geq 0$	3	B1
	$2y - 3x \geq -2$ (oe)		B1
	$2y + 3x \leq 10$ (oe)		B1
	(Allow strict inequalities) **NB:** Award the ePEN marks in the above order		

Question	Working Answer	Mark	Notes
16 (a)	$(A \cup B)' = \{3, 6, 7, 10, 14\}$	1	B1
(b)	Any one of $(A \cup B)' = A' \cap B' = "\{3, 6, 7, 10, 14\}"$ (ie ft their (a)) OR $\quad B' \cap C = C = \{6, 10, 13, 14\} \quad$ (**NB** $(A \cup B) \cap C = \varnothing$) OR $\quad A' = \{2, 3, 4, 6, 7, 8, 10, 12, 14\}$ and $B' = \{1, 3, 5, 6, 7, 9, 10, 11, 13, 14\}$ $(A' \cap B' \cap C) = \{6, 10, 14\} \quad$ (cao) **NB: (1)** Condone missing brackets **(2)** B1 for (a) **cannot** be earned in (b) retrospectively	2	B1 B1
17 (a)	20	1	B1
(b)	$\dfrac{5 + 8 + 10 + "20" + 25 + 40}{6}$ 18 **NB:** ft their answer to 3 sf	2	M1 A1ft

Question	Working Answer	Mark	Notes
18	$\left((2x+1)(3x^2+cx+d)=6x^3+(2c+3)x^2+(2d+c)x+d\right)$	3	
	$d=6$		B1
	$2c+3=-19$ OR $c+2d=1$		M1
	$c=-11$		A1
	$\Big($**OR Algebraic long division**:		
	$3x^2-11x....$		(M1)
	$c=-11$		(A1)
	$d=6$		(B1)
	NB: Seeing just $3x^2-11x+6$ without identification of the values of c and d also scores M1 A1$\Big)$		
	OR Synthetic Division:		

	Table: $-\dfrac{1}{2}\Big\vert$ 6 -19 1 6
	                   -3 11 -6
	 $\overline{}$
	            -22 12 0
			(M1)

	ie $6x^3-19x^2+x+6=\left(x+\dfrac{1}{2}\right)(6x^2-22x+12)=(2x+1)(3x^2-11x+6)$		
	$\therefore c=-11$		(A1)
	$\therefore d=6$		(B1)

Question	Working / Answer	Mark	Notes
19	$10 = k\,2^3$ OR $\dfrac{10}{2^3} = \dfrac{2160}{t^3}$	4	M1
	$k = 1.25,\;\; \dfrac{10}{2^3},\;\; \dfrac{10}{8},\;\; \dfrac{5}{4}$ OR $t^3 = \dfrac{2160}{\left(\dfrac{10}{2^3}\right)}$ (oe)		A1
	NB: or any of the above seen or implied in working		
	$t = \sqrt[3]{\dfrac{2160}{"1.25"}}\,,$ (oe)		M1(DEP)
	$t = 12$		A1
20	$-2 < x$ OR $x \le 2$	4	M1
	$-2 < x$ AND $x \le 2$		M1(DEP)
	$\Big($ OR Trial and Error Method Substitute $x = -2$ and $x = -1$ in $4x + 5$ OR Substitute $x = 2$ and $x = 3$ in $4x + 5$		(M1)
	Both		(M1(DEP))$\Big)$
	$-1,\; 0,\; 1,\; 2$		A2(−1eeoo)
	NB: In ePEN, deduct errors starting with the 2nd A box, so **one** error B1 B0, **two** errors B0B0		

Question		Working Answer	Mark	Notes
21	(a)	$\overrightarrow{AB} = \begin{pmatrix} 9 \\ -12 \end{pmatrix}$	1	B1
	(b)	$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP} = \begin{pmatrix} 1 \\ 8 \end{pmatrix} + \frac{1}{3} " \begin{pmatrix} 9 \\ -12 \end{pmatrix} "$	2	M1
		OR $\overrightarrow{OP} = \overrightarrow{OB} + \overrightarrow{BP} = \begin{pmatrix} 10 \\ -4 \end{pmatrix} - \frac{2}{3} " \begin{pmatrix} 9 \\ -12 \end{pmatrix} "$		
		$\Big($OR $\quad \frac{2}{3}\begin{pmatrix} 1 \\ 8 \end{pmatrix} + \frac{1}{3}\begin{pmatrix} 10 \\ -4 \end{pmatrix} \qquad\qquad$ (M1)$\Big)$		
		$\overrightarrow{OP} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \qquad\qquad$ (cao)		A1
	(c)	$\left|\overrightarrow{AP}\right| = \sqrt{"3"^2 + "(-4)"^2}$	2	M1
		(**NB:** ft on " $\overrightarrow{AP}$ " in (b) if used OR ft from (a) if $\overrightarrow{AP} = \frac{1}{3} " \overrightarrow{AB} "$ used)		
		5 $\qquad\qquad$ (cao)		A1

Question		Working Answer	Mark	Notes
22	(a)	Ship *B* marked with a cross and labelled.	1	B1
	(b)	Correct bearing of *C* from *A* seen (345°)	2	M1
		OR correct bearing of *A* from *C* seen (165°)		
		OR $\angle$(North)$AC = 15°$ OR $\angle BAC = 75°$		
				A1
		Summary: *AC* must be in the 4th quadrant and lying closer to A-North than *AB*		
		Point *C* accurately located (with *AC* 345±1°), marked with a cross and labelled *C*		
	(c)	Perpendicular Bisector Method:	2	
		Arcs, centred *B* and *C*, each having the same radius, drawn to the left and right of *BC,* intersecting at *P* and *Q*.		M1
		Join *PQA* so that *A*'s course is shown at least inside triangle *ABC*.		A1
		OR Angle Bisector Method:		
		Arc, centred *A*, intersecting *AB* and *AC*, AND arcs of equal radius, centred on the above two intersections, which		(M1)

intersect at point R

A's course drawn correctly so that it bisects $\angle BAC$ and passes through the points A and R

(A1)

NB: (1) A's course has to be drawn such that there is at most only at most a *hint* of white between the overlay and the drawn course close to BC and within triangle ABC.

**(2)** Ship A's course must be drawn within triangle ABC **and** from A to BC.

(3) The A mark in (c) is **dependent** on both (a)'s B mark and on (b)'s A mark having been attained.

Question	Working Answer	Mark	Notes
23 (a)	<u>Car *A*'s speed is decreasing</u> as it moves further away from *O*.	1	B1
(b)	Straight line going through (0, 5) and going through, eg, (4, 45) and intersects *A*'s curve twice. **NB:** 2nd B mark is **dependent** on the first B mark 	2	B1 B1

Question	Working Answer	Mark	Notes
(c)	*X*, car *A*'s gradient (speed) is larger than car *B*'s	1	B1
(d)	car *B*, *B*'s gradient (speed) is steeper (larger) than *A's* OR work out *A*'s speed by calculating the gradient at *Y* (should be 3→4 m/s) and then stating that *B*'s speed is greater than *A*'s. (see below for graph)	1	B1

23

Distance from O (m)

Time (s)
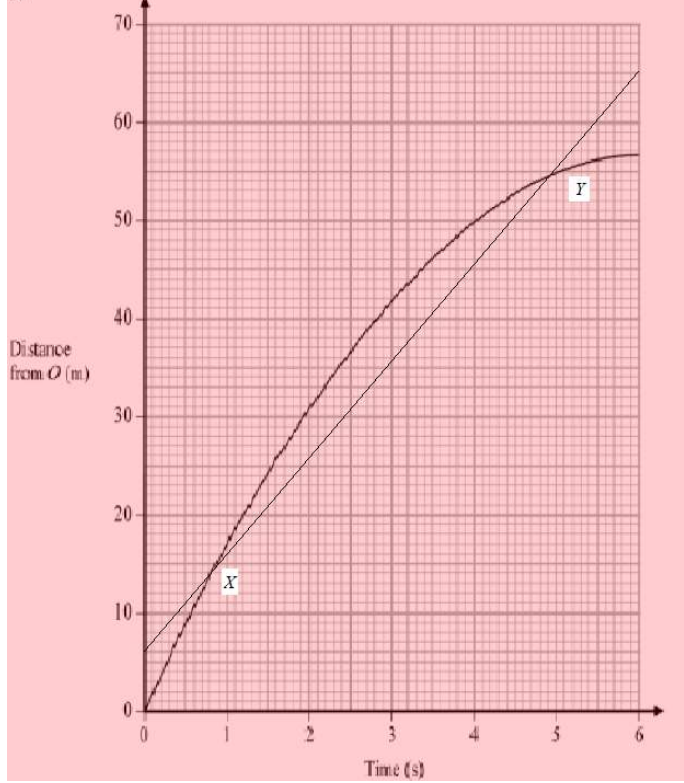
Question		Working Answer	Mark	Notes
24	(a)(i)	$PQ = 50 - 5x$ and $PS = 20 - 4x$	4	B1
	(ii)	Area of path, $A = 20 \times 50 - (50 - 5x)(20 - 4x)$		M1
		$= 1000 - 1000 - 20x^2 + 100x + 200x$ (expanding correctly)		M1 (DEP)
		$= 20x(15 - x)$ (m^2) (cso)		A1
		Special Case: M1 for $20 \times 50 - ("PQ" \times "PS")$ then M0 A0		
	(b)	$\because 20 > 4x \therefore x < 5$ AND $50 > 5x \therefore x < 10$	2	M1
		$\therefore x < 5$ OR $0 < x < 5$		A1
		NB: Send to Review any attempts which have an indication of possible work on page 18.		

Question	Working Answer	Mark	Notes
25	**Penalise nc ONCE only** ($CD = 7.2$, $\angle CBD = 29.5^o$, $\angle BAC = 71.79^o$)	3	
(a)	$4^2 = 2^2 + 5^2 - 2 \times 2 \times 5 \times \cos \angle ACB$		M1
	$\angle ACB = \cos^{-1}\left(\dfrac{2^2 + 5^2 - 4^2}{2 \times 2 \times 5}\right)$		M1(DEP)
	$\angle ACB = (49.4584) \rightarrow \mathbf{49.5}$		A1
(b)	$\dfrac{BD}{\sin\left("\angle BCD"\right)} = \dfrac{5}{\sin 20^o}$	3	M1
	$BD = \dfrac{5 \times \sin\left("\angle BCD"\right)}{\sin 20^o}$		M1(DEP)
	$BD = \mathbf{11.1}$		A1

Question		Working Answer	Mark	Notes
26	(a)	$-\dfrac{1}{4}$, -0.25	1	B1
	(b)	$(2x-3)\,y = x$ OR $(2y-3)\,x = y$ $\mathrm{f}^{-1}: x \mapsto \dfrac{3x}{2x-1}$ (oe but cao)	2	M1 A1
	(c)(i)	$\mathrm{fg}(x) = \dfrac{\left(\dfrac{x-1}{x}\right)}{2\left(\dfrac{x-1}{x}\right)-3}$	4	M1
		$= \dfrac{x-1}{2(x-1)-3x}$ (removing denominator x)		M1 (DEP)
		$\mathrm{fg}: x \mapsto -\dfrac{(x-1)}{(x+2)}$ OR $\dfrac{(1-x)}{(x+2)}$ OR $\dfrac{x-1}{-x-2}$		A1
	(ii)	-2, $x=-2$, "x/it is not -2" (oe)		B1ft
		NB: Denominator of h must be of the form $ax + b$ but **not** $2x - 3$		

Question	Working Answer	Mark	Notes
27 (a)(i)	A scale factor $\frac{1}{2}$, 2 OR $\frac{675}{54}$, $\frac{25}{2}$ (using area representing frequency so 675 small squares for 54 shops) - might implied in working OR 3 columns (27 squares) = 54 shops or 1 column (9 squares) = 18 shops OR Freq Density scale marked as 0, 18, 2 $0\rightarrow1$: $8 = \frac{freq}{1} \times " \frac{1}{2} "$ (oe)[*] **NB:** The B1 and M1 could be collected in (ii) if incorrect in (i) *freq* = **16**	4	B1 M1 A1
(ii)	$4\rightarrow6$: $7 = \frac{freq}{2} \times " \frac{1}{2} "$ (oe)[*] **NB:** The M1 can be earned here if not already earned in (i) above. *freq* = **28** [*]$\left(\text{OR } "\frac{2}{25}" \times (5 \times 40) \text{ for } 0\rightarrow1 \quad \text{or} \quad "\frac{2}{25}" \times (10 \times 35) \text{ for } 4\rightarrow6 \text{ for the (M1)}\right.$ using small squares OR 1×16 for $0 \rightarrow 1$ or 2×14 for $4 \rightarrow 6$ using columns$\left.\right)$		A1 (M1)

Question	Working Answer	Mark	Notes
(b)	Two correct mid-points used in two "correct" products: $$\frac{0.5\times"16"+2.5\times54+6\times\left(2\times"28"\right)}{"16"+54+2\times"28"}$$ Fully "correct" expression using their number of shops **3.8, 3.80** (km)	3	M1 M1 (DEP) A1

Question		Working Answer	Mark	Notes
28	(a)	$(5x)^2 = (4x-3)^2 + (3x+2)^2$	5	M1
		$25x^2 = 16x^2 - 24x + 9 + 9x^2 + 12x + 4$ (expanding, allow 1 sign or arithmetic error)		M1 (DEP)
		$13 - 12x = 0$　(collecting their like terms, no errors)　(oe)		M1 (DEP)
		$x = \dfrac{13}{12}$, awrt 1.08		A1
		Length of ladder $= \dfrac{65}{12}$, awrt 5.4 (m), $5\dfrac{5}{12}$		A1
	(b)	$\sin 76 = \dfrac{OP}{"\left(65\big/12\right)"}$　(oe)	2	M1
		$OP = 5.26$ (m)　(cao)		A1