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Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE
In Mathematics B (4MB1)
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
- awrt – answer which rounds to
- 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, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.
  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 to another.

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Question		Working	Answer	Mark	Notes
1		$\frac{7.5}{60\times 24}$ (oe)		**2**	M1
			$\frac{1}{192}$		A1
					Total 2 marks

2		$2\times(1)^2-5$ or $2\times 3^2-5$ oe		**2**	M1 or for one correct value
			-3, 13		A1
					Total 2 marks

3		$2(3-x)=3x$ **OR** $x=\frac{2\times 3}{3+2}$ **OR** $\frac{1}{x}=\frac{5}{6}$		**2**	M1 remove denominators OR a correct expression for x OR $\frac{1}{x}$ (must be a single fraction)
			$x=\frac{6}{5}$, $1\frac{1}{5}$, 1.2		A1 oe
					Total 2 marks

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4		$2x(x-3y)+5w(x-3y)$ **OR** $x(2x+5w)-3y(2x+5w)$		**2**	M1
			$(2x+5w)(x-3y)$		A1
					Total 2 marks

5	(i)		16	**2**	B1
	(ii)		Eg. Range is "$y \leq 16$" OR $g(x) \leq 16$		B1 allow $(-\infty,16]$ or $\{g : g \leqslant 16\}$ or $g \leq 16$ (No mark for $x \leqslant 16$)
					Total 2 marks

6		$1.25\ldots\times10^{n}$ OR $2^{-3}\times10^{-148}$ OR 0.125×10^{-148} (oe)		**2**	M1
			1.25×10^{-149}		A1
					Total 2 marks

7				**2**	M1 One term correct (allow unsimplified)
			$x^3+\frac{16}{x^5}$		A1 Fully correct oe eg $x^3 + 16x^{-5}$
					Total 2 marks

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8	(a)		0 or None (oe)	**1**	B1
	(b)		2	**1**	B1
					Total 2 marks

9		One of $-14 < 2x$ (oe) OR $8x \leq 16$ (oe)		**3**	M1
		Both			M1(DEP)
			$-7 < x \leqslant 2$		A1 Accept $-7 < x$ and $x \leq 2$ oe
					Total 3 marks

10		Total weight of the 800 large plates $= 800 \times 600$ (= 480 000) OR Total weight of the small plates = $(2500 - 800) \times 450$ (= 765 000)		**3**	M1 for a method to find one of the totals.
		$\dfrac{"(2500-800)\times 450" + "800\times 600"}{2500}$			M1(DEP) **NB:** DEP on correct methods for both weights
			498		A1 (cao)
					Total 3 marks

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11		$42 = 2\times3\times7$ $54 = 2\times3^3$ $66 = 2\times3\times11$ } Two of **OR** 2 | 42 | 54 | 66 3 | 21 | 27 | 33 3 | 7 | 9 | 11 3 | 7 | 3 | 11 Correct columns for two of 42, 54 or 66		**3**	M1 (may be numbers at the end of a factor tree or in a factor ladder) OR: (NB: 2 and 3 may be replaced by 6) 2 | 42 | 54 | 66 3 | 21 | 27 | 33 7 | 9 | 11
	(i)		LCM = 4158		A1 dep on M1
	(ii)		HCF = 6		A1 dep on M1
					NB: SC Deduct one A mark if correct values for LCM and HCF are swapped
					Total 3 marks

12		Prob (not arriving early) = 0.85 + 0.07 **OR** $0.85\times500 + 0.07\times500 \quad (=425+35)$		**3**	M1
		No. of trains arriving early = (1 – (“0.85 + 0.07”)) × 500 **OR** $500 - ("425"+"35")$			M1(DEP)
			40 (trains)		A1
					Total 3 marks

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13			$3y - 2x \geq 3$	**3**	B1 oe eg $y \geq \frac{2x}{3} + 1$
			$y \geq 6 - 3x$		B1 oe eg $y + 3x \geq 6$
			$x + y \leq 6$		B1 oe eg $y \leq 6 - x$
					NB: Allow > for ≥ and < for ≤
					Total 3 marks

14			$\{a, b\}$, $\{a, c\}$, $\{a, d\}$, $\{b, c\}$, $\{b, d\}$, $\{c, d\}$	**3**	B3 (-1eeoo)
					NB: Penalise extra permutations once only
					Total 3 marks

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15		$\frac{x(7x-3)-2x(5x-9)}{6}$ **OR** $\frac{x}{6}[(7x-3)-2(5x-9)]$ **OR** $\frac{7x^2}{6}-\frac{3x}{6}-\frac{5x^2}{3}+\frac{9x}{3}$		**3**	M1 oe
		$\frac{7x^2-3x-10x^2+18x}{6}$ **OR** $\frac{x}{6}[7x-3-10x+18]$ **OR** $\left(\frac{7}{6}-\frac{10}{6}\right)x^2-\left(\frac{1}{2}-3\right)x$			M1(DEP)
			$\frac{-x^2+5x}{2}$		A1 (oe but must be fully simplified)
					Total 3 marks

16		Length of other side is $\frac{28-2\times 8}{2}$ (oe) (= 6)		**3**	M1
		Length of diagonal = $\sqrt{8^2+"6"^2}$			M1 (DEP)
			10		A1
					Total 3 marks

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17		$\sin 50^o = \frac{AD}{20}$ or $\cos 50^o = \frac{DC}{20}$ (oe) **OR** Area of $\Delta ABC = \frac{1}{2} \times 20 \times 30 \times \sin(40) (= 192.836...)$		**3**	M1 (AD = 15.321 and DC = 12.856) (oe for both lengths)
		$\frac{1}{2} \times "DC" \times (30 + "AD")$ **OR** $\frac{1}{2} \times 20 \times "DC" \times \sin 50^o + "192.836..."$ **OR** "12.856" × "15.321" + (0.5 × "12.856" × (30 −"15.321"))			M1 (DEP)
			291		A1
					Total 3 marks

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18		$\left(\sqrt{35}+3\sqrt{5}-2\sqrt{7}-6\right)\times\left(\sqrt{5}+2\right)$		**3**	M1 showing clear intention to Remove denominator by multiplying numerator and denominator by $(\sqrt{5}+2)$
		$\sqrt{35\times5}+3\sqrt{5\times5}-2\sqrt{7\times5}-6\sqrt{5}+2\sqrt{35}+6\sqrt{5}-4\sqrt{7}-12$ oe			M1(DEP) Expanding numerator (allow one error) oe **OR**
			$3+\sqrt{7}$		A1(DEP on M2)
		Alternative method			
		$\frac{\sqrt{5}\left(\sqrt{7}+3\right)-2\left(\sqrt{7}+3\right)}{\sqrt{5}-2}$ or $\frac{\sqrt{7}(\sqrt{5}-2)+3(\sqrt{5}-2)}{\sqrt{5}-2}$ or $\frac{\left(\sqrt{5}-2\right)\left(\sqrt{7}+3\right)}{\sqrt{5}-2}$			M2 for correct factorisation
			$3+\sqrt{7}$		A1(DEP on M2)
					Total 3 marks

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19		35 miles per gallon → $\frac{1}{35}$ gallons per mile **OR** 35 mpg $\times 1.609$ (= 56.315 km/gallon) **OR** $100 \div 1.609$ (=62.1504…)		**4**	M1 (possibly seen in an expression) (ie invert 35) mpg to km/gallon number of miles in 100 km
		$\frac{4.546}{35}$ (litres/mile) **OR** $\frac{1}{35} \times \frac{100}{1.609}$ (gallons/100km) oe eg "62.1504" $\div 35$ (=1.7757...) **OR** "56.315 km/gallon" ÷ 4.546 (= 12.3878 km/litre)			M1(DEP) Litres per mile **OR** gallons per 100 km **OR** km per litre
		$\frac{1}{35} \times 4.546 \times \frac{100}{1.609}$ oe eg "1.7757... $\times$ 4.546 (litres/ 100km) **OR** $100 \div 12.3878$			M1(DEP) for a fully correct method (all units converted)
			awrt 8.07		A1
					Total 4 marks

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20	(a)		$\begin{pmatrix} 19 & -27 \\ -45 & 64 \end{pmatrix}$	**2**	B2(−1eeoo in a matrix of the correct order)
	(b)		$\begin{pmatrix} 12 & -17 \\ 31 & -44 \\ -23 & 33 \end{pmatrix}$	**2**	B2(−1eeoo in a matrix of the correct order)
					Total 4 marks

21	(a)		240	**1**	B1 (No. of passengers in $95 \le w < 115$)
	(b)	(Ht. of $50 \le w < 60$ bar) – FD = 8 (Ht. of $80 \le w < 95$ bar) – FD = 18 (Ht. of $95 \le w < 115$ bar) – FD = 12 (NB: 1 cm = 2 units on FD axis)	Completely correct histogram	**3**	M1 for a correct bar OR a correct scale for FD
					A1 for 2 correct bars OR one correct bar and correct scale for FD
					A1 for all bars correct **and** correct scale for FD
					Total 4 marks

22	(a)(i)		10	**2**	B1
	(ii)		Farmers who keep cattle, sheep and goats		B1 oe
	(b)(i)		15	**2**	B1
	(ii)		Farmers who keep sheep but not goats and cattle		B1 oe eg sheep farmers only
					Total 4 marks

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23		$96 = k \times 4^3$		**4**	M1
			$k = 3/2$		A1 oe eg $k = 1.5$, $k = 96/4^3$ (Might be seen in working)
		$(s(6) - s(5) =)$ $"\frac{3}{2}" \times 6^3 - "\frac{3}{2}" \times 5^3$ $(324 - 187.5)$ **OR** $"\frac{3}{2}"(216 - 125)$			M1 (DEP on M1)
			136.5		A1 Accept awrt 137
					Total 4 marks

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24	(a)	100 000 : 40 000 oe OR 1 km² = 1 × 10^{10} cm² OR 2.4 km² = 2.4 × 10^{10} cm² OR 1 cm² represents 0.16 km² oe		**3**	M1 or 1 : 1 600 000 000 oe Statement or use of area equivalence or ratio
		$\left(\frac{100\ 000}{40\ 000}\right)^2 \times 2.4$ oe eg $\frac{2.4}{0.16}$ OR 2.4 ×100 000² ÷ 1 600 000 000 oe OR 0.16A = 2.4			M1 a fully correct method to find the area of the field in cm² or a fully correct equation for the area of the field
			15		A1
	(b)	$\frac{n}{100\ 000} \times 8 = 2$ (oe)		**2**	M1 oe eg (2 × 100 000) ÷ 8
			25 000		A1
					Total 5 marks

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25		$w^2 = \dfrac{x-y-3w^2}{5x+y-1}$		**5**	M1 (Squaring)
		$w^2(5x+y-1) = (x-y-3w^2)$			M1 (DEP) (Remove denominator)
		$5xw^2 + w^2y - w^2 = x - y - 3w^2$			M1 (DEP) (Expanding – allow one error only)
		$x(5w^2-1) = -w^2y - y - 2w^2$			M1 (DEP) (Collecting terms in x on one side and factorising and other terms the other side – ft one error)
			$x = -\dfrac{w^2y + y + 2w^2}{5w^2 - 1}$		A1 (oe) eg $x = \dfrac{w^2(-y-2)-y}{5w^2-y}$
					Total 5 marks

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26		**Method 1**			
		$\angle ACD = 30$		5	M1
		$\angle ADC = 180 - 30 - 30$ (=120)			M1
		$\angle ABC = 180 - 120$ (=60) **and** $\angle BAC = 90$	90		A1 dep on M2 for showing a full method to $\angle BAC = 90°$
			And full reasons for method used		B2 dep on A1 for all correct reasons for method used: (allow ∠ for angle and V for triangle) Base angles of isosceles triangle Angles in triangle total 180°/angles in triangle total 180° Opposite angles in cyclic quadrilateral total 180° BC is a diameter as the angle in a semi-circle is a right angle oe BC is a diameter as the angle at the centre is double the angle at the circumference oe (B1 dep on M1 for one reason that is a circle theorem)
		Method 2			
		$\angle ACD = 30$		5	M1
		$\angle ACB = 30$			M1
		$\angle BAC = 180 - (30 + 30 + 30) = 90$	90		A1 dep on M2 for showing a full method to $\angle BAC = 90°$
			And full reasons for method used		B2 dep on A1 for all correct reasons for method used: (allow ∠ for angle and V for triangle) Base angles of isosceles triangle Alternate angles Opposite angles in cyclic quadrilateral total 180° BC is a diameter as the angle in a semi-circle is a right angle oe BC is a diameter as the angle at the centre is double the angle at the circumference oe (B1 for one reason that is a circle theorem)
					Total 5 marks

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27		Time to travel 35 m at 5 m/s = $\frac{35}{5}$ s		**5**	M1
			7 s		A1 shown clearly in working or graph correctly drawn
		$\frac{1}{2}\times 5\times t = 10$ (oe)			M1
			4 s		A1
			2 straight lines drawn		B1 **Line 1:** Straight line drawn from (0, 5) to (7, 5) **Line 2:** Straight line drawn from (7, 5) to (7 + 4, 0) ie (11, 0)
					Total 5 marks

28	(a)	πr OR $2\pi\left(\frac{r}{2}\right)$		**3**	M1
		$\pi r + 2\pi\left(\frac{r}{2}\right)$ oe			M1 (DEP) for complete method to find perimeter of shaded region
			$2\pi r$		A1
	(b)	$FH = r$ and $\angle FOH = 90^{o}$		**4**	B1
		(Area of $\Delta FHO =$)$\frac{1}{2}\times\frac{r}{2}\times r$ oe eg $0.25r^2$			M1
		$\therefore$ Area of $FPBQH = \frac{"90"}{360}\times\pi r^2 - \frac{1}{2}\times\frac{r}{2}\times r$			M1 (DEP) for complete method to find area *FPBQH*
			$\frac{r^2}{4}(\pi - 1)$		A1 (oe)
					Total 7 marks

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29	(a)	$8^2 = 6^2 + 7^2 - 2\times 6\times 7\times \cos\angle ACB$		3	M1
		$\angle ACB = \cos^{-1}\left(\dfrac{6^2+7^2-8^2}{2\times 6\times 7}\right)$			M1 (DEP)
			75.5		A1
	(b)	$\tan 25 = \dfrac{4}{h}$ oe eg $h = \sqrt{\left(\dfrac{8\sin 65}{\sin 50}\right)^2 - 4^2}$ (=8.578…)		4	M1 (oe, where h is the perpendicular height of ΔADB and so of the pyramid)
		Area of $VABC = \dfrac{1}{2}\times 6\times 7\times \sin"\angle ACB"$ (=20.311)			M1 (award even if part of a calculation)
		Volume of $ABCD$ = $\dfrac{1}{3}\times"\text{Area of } VABC"\times"h"$			M1(DEP)
			58.1		A1
					Total 7 marks

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