Mark Scheme (Results)

January 2022

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.

Question	Working	Answer	Mark	Notes	Total
1	$\frac{15}{4}\times\frac{8}{5}$ or $\frac{30}{8}\div\frac{5}{8}$ oe		2	M1oe for a start to the calculation	
	$\frac{15}{4}\times\frac{8}{5}=\frac{120}{20}=6$ or $\frac{\cancel{15}^{3}}{\cancel{4}^{1}}\times\frac{\cancel{8}^{2}}{\cancel{5}^{1}}=6$ or $30\div5=6$	6		A1oe for completing the calculation to 6 continuing their method.	
					2

2	$\frac{n^2+3}{2}=222$, $n^2=2\times222-3$		2	M1 for a correct calculation for n^2	
	$n^2=441$, $n=21$	yes, $n=21$		A1 for $n=21$ and yes oe	
					2

3	450 ml = 0.45 l or 3 l = 3000 ml or $\frac{450}{3000}$ or $\frac{0.45}{3}$ oe unsimplified fraction		2	M1	
		$\frac{3}{20}$		A1	
					2

4	$\frac{360}{64}\times 40$ oe		2	M1	
		225		A1	
					2

5	180 + 63 or a clear diagram showing *P* and *Q* clearly and correctly placed with (0)63 marked		2	M1	
		243		A1	
					2

6	$\frac{BC}{12}=\frac{21}{16}$oe or $BC=5\times\frac{12}{16}+12$oe		2	M1 a correct expression for *BC*	
		15.75		A1 oe (allow 15.8)	
					2

7	3 375 000 ÷ ($2^3 \times 3^3$) (= 15625)oe or 3 375 000 = $2^3 \times 3^3 \times 5^6$		2	M1	
		6		A1 dep on M1	
					2

8		$20x^4+\frac{16}{x^3}$	2	B2 fully correct, B1 for one term correct oe, eg $20x^4 + 16x^{-3}$	
					2

9	$10 \times PC = 9 \times 7$ oe eg $\frac{PC}{7} = \frac{9}{10}$		2	M1 for a correct equation involving PC	
		6.3		A1	
					2

10	$2 \times -1.5 - -0.5x = 0.5$ oe		2	M1 for a correct equation for x	
		7		A1	
					2

11	CBD or $CDB = \frac{180-150}{2} (=15)$		3	M1 shown on diagram or stated	
	360 ÷ "15" or a correct equation for the interior eg $\frac{(n-2)\times 180}{n} = 165$			M1 for a correct calculation to find the number of sides or a correct equation for the number of sides.	
		24		A1	
					3

12	5×80 or 4×78 or $4 \times 2 = 8$		3	M1	
	$5 \times 80 - 4 \times 78$ or $80 +$ "8"			M1	
		88		A1 SC B2 for 88/100 Allow 88% for full marks	
					3

13	$\frac{5(6x-3)-7(2x-3)}{5\times 7}(=\frac{6}{5})$ oe or $5(6x-3)-7(2x-3)=7\times 5\times\frac{6}{5}$oe		3	M1 for writing fractions over the same correct common denominator or for showing correct products in a correct equation	
	$30x - 15 - 14x + 21 = 42$ oe eg $16x = 36$			M1 for removal of all fractions and brackets in a correct equation – allow one sign error	
		2.25		A1 oe	
					3

14	$\angle ABC = 63$ or $\angle BAD = 180 - 52 - 63$ (= 65)		3	M1	
		65		A1	
				B1 for alternate segment theorem and angles in a triangle (or angles in a triangle add to 180) OR Angles on a straight line (or angles on a line add to 180)and alternate segment theorem – dependent on M1 A1	
					3

15	$\frac{4+\sqrt{20}}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2}$ oe		3	M1 multiply numerator and denominator by $\sqrt{5}+2$	
	$\frac{4\sqrt{5}+8+\sqrt{100}+2\sqrt{20}}{5-4}$ oe			M1dep on first M1 expand numerator with three terms correct – allow $(\sqrt{5}-2)(\sqrt{5}+2)=1$	
		$18+8\sqrt{5}$		A1 dep on first M1	
					3

16	12.5, 17.5, 8.45, 8.55, 4.5 or 5.5		3	B1 for the upper or lower bound of one of the values	
	$12.5-\frac{8.55}{4.5}$			M1 for $\text{LB}_a-\frac{\text{UB}_b}{\text{LB}_c}$ where $12.5 \leqslant \text{LB}_a < 15,\ 8.5 < \text{UB}_b \leqslant 8.55,\ 4.5 \leqslant \text{LB}_c < 5$	
		10.6		A1 from correct working	
					3

17	$8[(x-3)^2-9]+10$ oe or (RHS=) $ax^2+2abx+(ab^2+c)$		3	M1 or for one of a, b, c correct	
	$8(x-3)^2-72+10$ $a=8$ and $2ab=-48$			M1 or for two of a, b, c correct	
		$a=8,\ b=-3,\ c=-62$		A1 or for $8(x-3)^2-62$	
					3

18	$\pi\times r^2\times 7=225$		4	M1	
	$r=\sqrt{\frac{225}{7\pi}}(=3.198...)$			M1dep on first M mark	
	$2\times\pi\times\frac{225}{7\pi}+\pi\times 2\times\sqrt{\frac{225}{7\pi}}\times 7$ oe			M1 ft their $r=3.19\ldots$	
		205		A1 (204.969877…)	
					4

19	$(AB=)\sqrt{18^2-5^2}\ (=\sqrt{299}=17.29...)$ or $\sin DAB=\frac{5}{18}\ (DAB=16.127...)$		4	M1 **Assuming *ADC* is a right-angle scores no marks**	
	$(AB=)\sqrt{18^2-5^2}\ (=\sqrt{299}=17.29...)$ **and** one of $\sin DAB=\frac{5}{18}$ or $\tan DAB=\frac{5}{\sqrt{299}}\ (DAB=16.127...)$ or $\tan CAB=\frac{13}{\sqrt{299}}\ (CAB=36.936...)$			M1 for a correct statement for *AB* **and** one of sin *DAB*, tan *DAB* or tan *CAB*	
	$\tan^{-1}(\frac{13}{\sqrt{299}})-\sin^{-1}(\frac{5}{18})$ oe eg 36.936... – 16.127...			M1	
		20.8		A1	
					4

20	$(y-5)(7-x)=3x+4$ oe		4	M1 but $y(7-x)=5+3x+4$ is no marks	
	$7y - xy - 35 + 5x = 3x + 4$ oe			M1 expand correctly	
	$5x - 3x - xy = 4 - 7y + 35$ oe			M1 at least 2 terms in x on one side – allow one sign error when rearranging but all terms present	
		$x=\frac{39-7y}{2-y}$		A1 oe but must be simplified (must see 'x =...' in working for full marks)	
					4

21	eg $16^2 : 12^2$ or $4^2 : 3^2$ or $\frac{16}{9}$ oe		4	M1 use of area SF – no marks if not using area SF or if only using length SF	
	eg $(4^2 - 3^2)$ shares = 31.5 or 1 share = 4.5 or $3^2 : 4^2 = x : x + 31.5$ or $\frac{16}{9}CDE = CDE + 31.5$ or $\frac{CDE}{0.75^2} - CDE = 31.5$ or $1.\dot{3}CDE = 31.5 + CDE$ oe			M1 for their $\left(\frac{16}{12}\right)^2 = \frac{31.5+x}{x}$ or allow reciprocal on RHS - but must be correct form	
	eg 9 × 4.5 or $x=\frac{3^2\times 31.5}{4^2-3^2}$ or CDE = (31.5 × 9) ÷ 7 oe			M1 a fully correct calculation for area EDC	
		40.5		A1	
					4

22	(a)		$0 < m \leqslant 10$	1	B1 oe eg 0 - 10	
	(b)	$5\times25 + 15\times16 + 25\times14 + 35\times11 + 45\times4$ $(125 + 240 + 350 + 385 + 180)$ $(=1280)$		3	M1 for *xf* calculated for at least 4 class intervals where *x* is a number in the range.	
		$1280 \div 70$			M1 for *xf* calculated for at least 4 class intervals where *x* is the midpoint and divided by 70	
			18.3		A1 awrt 18.3	
						4

23	$0.15 \times 5\ (= 0.75)$ or $0.15\times\frac{5}{12}(=\frac{1}{16})$ $(=0.0625)$ oe or $\frac{2}{7}\times\frac{7}{12}(=\frac{1}{6})(=0.1666....)$ or $\frac{2}{7}\times7(=2)$ oe		4	M1 oe e.g., for $0.85\times\frac{5}{12}\left(=\frac{17}{48}\right)$ or $\frac{5}{7}\times\frac{7}{12}=\frac{5}{12}$	
	$"\frac{1}{16}"+"\frac{1}{6}"$ $(=\frac{11}{48})(=0.229...)$ oe or $\frac{0.75+2}{12}(=\frac{11}{48})$			M1 oe both fractions < 1 or for $"\frac{17}{48}"+"\frac{5}{12}"\left(=\frac{37}{48}\right)$	
	$\frac{3}{4}\times\left(1-\frac{11}{48}\right)$ oe			M1 oe or for $"\frac{37}{48}"\times\frac{3}{4}$	
		$\frac{37}{64}$		A1 oe fraction	
					4

24	For 2 of: $12^{3x} = (4 \times 3)^{3x}$ $24^{2x} = (8 \times 3)^{2x}$ $27 = 3^3$		4	M1	
	eg $\frac{2^{6x} \times 3^{3x} \times 3^{4x^2-3x} \times 3}{2^{6x} \times 3^{2x}} = 3^3$			M1 dep on previous M mark	
	A correct quadratic equation eg $4x^2 - 2x - 2 = 0$ or $2x^2 - x - 1 = 0$			M1	
		-0.5 , 1 oe		A1 both values	
					4

25 (a)		3, 6, 9	1	B1 all present, no duplicates and none missing	
(b)		2, 3, 4, 5, 6, 9,10, 12	1	B1 all present, no duplicates and none missing	
(c)		1, 4, 7, 8, 11, 12	1	B1 all present, no duplicates and none missing	
(d)		Ø{5}(6}{7}{5,6} {5,7}{6,7}{5,6,7}oe	3	B3 all sets with no duplicates (B2 for 6 or 7 correct, B1 for 4 or 5 correct)	
					6

26 (a)	$7d - 5d \leqslant -3$ or $2d \leqslant -3$ or $3 \leqslant 5d - 7d$ or $3 \leqslant -2d$ oe		2	M1	
		$d \leqslant -1.5$		A1	
(b)	$10a^2 - 15a - 12a^2 - 4a$		2	M1 for 3 terms correct	
		$-2a^2 - 19a$		A1 ISW if attempt to factorise but A0 if $2a^2 + 19a$ oe	
(c)		$6x^2y$	2	B2 (B1 for 2 of 3 terms correct as part of a product)	
(d)			2	M1 for 2 factors that when multiplied give 2 out of 3 terms correct	
		$(3n + 2)(5n - 7)$		A1 condone x for n but A0 if correct factorisation seen but then go on and solve for n	
					8

27	$(AC =) \frac{6.7}{\sin(59)} \times \sin(180-48-59)$ (=7.47...)		5	M1	
	(area ACD =) 0.5 × 6.7 × 7.47 × sin48			M1dep on previous M mark – or M2 for a complete method to find area of ACD e.g., $\frac{1}{2}(6.7)(CD)\sin(180-48-59$ with CD found from the sine rule	
	$ABC = \cos^{-1}(\frac{5.2^2+8.2^2-7.47^2}{2\times5.2\times8.2})(=63.2...)$ or $BAC = \cos^{-1}(\frac{8.2^2+7.47^2-5.2^2}{2\times8.2\times7.47})(=38.4...)$ or $BCA = \cos^{-1}(\frac{5.2^2+7.47^2-8.2^2}{2\times5.2\times7.47})(=78.4...)$			M1dep on first M mark	
	"18.6..." + 0.5 × 8.2 × 5.2 × sin"63.2" oe (= 18.6... + 19.02...)			M1dep on all previous M marks	
		37.6		A1	
					5

28	$\frac{dy}{dx} = 6x^2 - 21x + 12$			M1 for two terms correct	
	(gradient at P =) 6 – 21 +12 (= −3)			dep on M1 – sub. $x = 1$ into derivative	
	$6x^2 - 21x + 12 = -3$ oe			M1dep on 1st 2 M marks	
	Q = (2.5, 0.625)			A1	
	gradient $= \frac{8.5 - "0.625"}{1 - "2.5"} (= \frac{7.875}{-1.5})$ oe			M1dep on all M marks	
		−5.25		A1 oe	
					6

29	(a)	$3 \times 5^3 - 20 \times 5^2 + 5k + 10 = 0$ or $3 \times 5^3 - 20 \times 5^2 + 5 \times 23 + 10$			M1	
		$5k = 115$, $k = 23$ or 375 – 500 + 115 + 10 = 0	Clearly shown		A1 dep on M1 seen – at least one line of simplification/working from substitution to given value of k	
	(b)	$(x - 5)(3x^2$ .....)			M1	
		$(x - 5)(3x^2 - 5x - 2)$			A1	
		$(x - 5)(3x + 1)(x - 2)$			M1 ft for 2 factors that when multiplied give 2 out of 3 terms correct	
			$5, -\frac{1}{3}, 2$		A1	
						6