



Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE
In Mathematics A (4MA1)
Paper 2HR

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January 2020

Publications Code 4MA1_2HR_2001_MS

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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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Apart from Questions 1b, 7, 16c, 19a, 21b, 24 and 25 where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1 (a)		5^{19}	1	B1
(b)			2	M1 A factor tree / division ladder of 3 or more factors ($\neq 1$), multiplying to 800, which must include 2 and 5. Condone 1 error when product $\neq 800$
		$2 \times 2 \times 2 \times 2 \times 5 \times 5$		A1 dep on M1 oe eg $2^5 \times 5^2$
				Total 3 marks

2	$10 \times 5 + 30 \times 11 + 50 \times 8 + 70 \times 19 + 90 \times 9$ $(50 + 330 + 400 + 1330 + 810)$		3	M2 Correct products using midpoints (allowing one error) with intention to add. M1 for products using frequency and a consistent value within the range (allowing one error) with intention to add. or correct products using midpoints without addition (allow 1 error)
		2920		A1 N.B. $2920 \div 52 (=56.2..)$ scores M2A0
				Total 3 marks

3	$4x$ or $x - 7$ $x + 4x + x - 7 = 137$ oe $x = 144 \div 6 (=24)$ or $6x = 144$ or $6x - 144 = 0$		4	M1 Correct expression for B or C M1 Correct equation M1 Gathering up the x's and numbers Dep on previous M1
		17		A1
				Total 4 marks

Question	Working	Answer	Mark	Notes
4	$8.5^2 + 5.6^2 (= 103.61)$ $\sqrt{8.5^2 + 5.6^2}$		3	
			M1	
			M1	
		10.2	A1	Accept 10.1 to 10.2 or better
				Total 3 marks

5	3 hours 36 mins = 216 (mins) or 3.6 (hours) or $3 \frac{36}{60}$ oe (hours) $2470 \div 3.6$ or $2470 \div 3 \frac{36}{60}$ or $2470 \div 216 \times 60$		3	
			M1	
			M1	Allow $2470 \div 3.36 (=735$ or better)
		686	A1	Accept 686.1 or better
				Total 3 marks

6		Fully correct perpendicular bisector with all relevant arcs shown.	2	Fully correct bisector with all arcs. Correct arcs can be on the same side of <i>AB</i> . B1 for all correct arcs and no bisector drawn or for a correct bisector within guidelines but no arcs. NB: On tramlines = within tramlines.
			B2	
				Total 2 marks

7	(adding) $10x = -5$ or $21x + 35y = 42$ $21x - 15y = -33$ then $50y = 75$		3	Correct method to eliminate x or y Or making coefficients of x or y the same and correct operator has been applied to eliminate x or y (2 out of 3 terms correct implies a correct operator) or correct algebraic substitution for x or y into other equation
		$x = -0.5$ oe $y = 1.5$ oe		
			A1	Both A marks dep on M1
			A1	
				Total 3 marks

Question	Working	Answer	Mark	Notes
8	$20\,000 \times 0.81^3$ oe	10 629	M2	M1 for $20\,000 \times 0.81$ oe (= 16 200) or $20\,000 \times 1.19$ oe (= 23 800) or $20\,000 \times 1.19^3$ oe (= 33 703.18)
			A1	Accept 10 628 → 10 629
				Total 3 marks

9	$30 = \frac{27}{1.2x}$		3	Or for $\frac{27}{30}$ (= 0.9)
	$1.2x = \frac{27}{30}$ or $36x = 27$ or $22.5 \div 30$			
		0.75 oe	A1	
				Total 3 marks

10 (a)		3.74×10^7	2	B1 for 37 400 000 (oe but not in standard form) or 3.74×10^n ($n \neq 7$) or 3.7×10^7 or 3.8×10^7
(b)		11	1	B1 Allow 11 → 11.1
				Total 3 marks

11 (a)		-1, 0, 1, 2, 3, 4	2	B1 for -2, -1, 0, 1, 2, 3, 4 or -1, 0, 1, 2, 3
(b)		$y \leq 6$ oe $x + y \geq 5$ oe $y \geq x - 3$ oe	2	B2 for 3 correct inequalities B1 for 2 correct inequalities SC B2 for $y \geq 6$ oe and $x + y \leq 5$ oe and $y \leq x - 3$ oe (In all cases allow < in place of \leq , and > in place of \geq)
				Total 4 marks

Question	Working	Answer	Mark	Notes
12	$180 - 2 \times 66 (= 48)$		3	M1 Could be marked on diagram
	$(360 - \text{"48"}) \div 2 (= 156)$			
	$180 - \text{"156"} (= 24)$			
	$360 \div \text{"24"}$			
	Alt : $180 - 2 \times 66 (= 48)$			
	$360 \div (0.5 \times \text{"48"})$			M1ft Final stage of calculation
	Alt: $180 - 2 \times 66 (= 48)$			M1 Could be marked on diagram
	$(360 - \text{"48"}) \div 2 (= 156)$			M1ft Final stage of calculation
	$\frac{n}{180(n-2)} = \text{"156"}$			M1 Could be marked on diagram
	$\text{"24"}; n = 360 \text{ or } \frac{180(15-2)}{15} (= 156)$			M1ft Final stage of calculation or embedded correct answer.
		15		A1
				Total 3 marks

13	$\frac{h}{2} \times (7+12) \times 10 = 608 \text{ oe}$		3	M2 M1 for $\frac{h}{2} \times (7 + 12) \times 10$
		6.4		Total 3 marks

14	5, 7, 11, 12, 13, 14, 15, 16, 17, 18, 18		3	M1 Ordering marks (allow 1 error)
	11 and 17 selected			M1 LQ = 11 and UQ = 17 identified
				A1
		6		Total 3 marks

15 (a)		2, -1.5, -3, 0	2	B2 B1 for 2 or 3 values correct
	(b)		2	M1ft At least 5 points plotted correctly ft from table dep on B1 in part (a)
				A1 For correct smooth curve.
				Total 4 marks

Question	Working	Answer	Mark	Notes
16 (a)		$\frac{3}{10}, \frac{7}{12}, \frac{5}{12}, \frac{7}{12}, \frac{5}{12}$	2	B2 B1 for $\frac{3}{10}$ oe B1 for all other correct probabilities 2d.p truncated or rounded (e.g 0.58 or 0.41 or 0.42)
(b)	$\frac{7}{10} \times \frac{5}{12}$ " or " $\frac{3}{10} \times \frac{7}{12}$ " oe $\frac{7}{10} \times \frac{5}{12}$ " + " $\frac{3}{10} \times \frac{7}{12}$ " oe		3	M1ft M1ft
(c)	$\frac{3}{10} \times \frac{5}{12} \times x = \frac{3}{100}$ oe $x = \frac{3}{100} \div \frac{15}{120}$ " (= $\frac{6}{25}$) oe	$\frac{56}{120}$ oe	3	A1 eg $\frac{7}{15}$ or 0.46... (2 dp truncated or rounded) M1ft A correct equation involving the unknown probability M1ft Isolating or calculating the value of x
		25	A1	Dep on M1
			Total 8 marks	

17 (a)			3	B3 All 8 values inserted correctly B2 for 4 to 7 correct values B1 for 2 or 3 correct values NB: Expressions involving x do not have to be simplified.
(b)	$[(25 - x) + (x - 6) + (16 - x) + 3 + 6 + 2 + 9 + 5] = 50$		2	M1ft For sum of all their values = 50 oe
(c)		10 14	1	A1 B1ft
			Total 6 marks	

Question	Working	Answer	Mark	Notes
18	eg $9 \times 6 = 8 \times PD$ oe	6.75	2	M1 A correct equation involving <i>PD</i> A1 oe
				Total 2 marks
19				
(a)	eg $\frac{2(4-3x)}{10} - \frac{5(3x-5)}{10} = -3$ oe or $2(4-3x) - 5(3x-5) = -3 \times 2 \times 5$ $8 - 6x - 15x + 25 = -30$ oe	3	3	M1 Correct fractions over common denominator as an equation or Multiplying both sides by 10 M1 A correct equation with no denominators or brackets A1 dep on M1
(b)	$(5y + 8)(y - 5) (\leq 0)$ or $(y =) \frac{-17 \pm \sqrt{(-17)^2 - 4 \times 5 \times -40}}{2 \times 5}$ -1.6, 5 oe	-1.6 ≤ y ≤ 5 oe	3	M1 Correct method to solve 3 term quadratic – factorising or correct use of formula A1 Correct critical values A1 Condone change of variable in place of y throughout this question.
				Total 6 marks
20				
	(ASF =) $\frac{13^2}{9^2}$ or $\frac{9^2}{13^2}$		4	M1 Correct SF for area. Accept 1.44 ² (= 2.07 or 2.09) or better for ASF or 0.69 ² (= 0.47 or 0.48) or better for ASF
	eg $A + \left(\frac{13^2}{9^2}\right) A = 1800$ eg $\frac{250}{81} A = 1800$			M1ft Dep on previous M1 M1ft
		583.2		A1 Awrt 583
				Total 4 marks

Question	Working	Answer	Mark	Notes
21 (a)	Factorising numerator as $(5x + 4)(2x + 3)$		3	M1
	Factorising denominator as $(2x + 3)(2x - 3)$			M1
		$\frac{5x + 4}{2x - 3}$		A1
(b)	$(8^{5y} =) 2^{15y}$ or $(4^n =) 2^{2n}$ or 2^{5y+2}		4	M1
	$2^{5y+2} = 2^{15y - 2n}$ oe			M1
	$5y + 2 = 15y - 2n$ oe			M1
		$n = 5y - 1$		A1
Total 7 marks				

22	$(2865 =) \frac{30}{2} (2 \times -6 + 29d)$		4	M1	Correct expression for sum of 30 terms
	$d = 7$			A1	Correct value for d
	$-6 + 8 \times \text{"7"} \text{ or } (nth \text{ term} =) -6 + \text{"7"}(n - 1)$			M1	ft their d . Dep on M1
		50		A1	
Total 4 marks					

Question	Working	Answer	Mark	Notes
23	$-2(x^2 + 6x - 3.5)$ or $-2(x^2 + 6x) + 7$	$25 - 2(x + 3)^2$	3	M1
	$-2[(x + 3)^2 - 9 - 3.5]$ or $-2[(x + 3)^2 - 9] + 7$			M1
	Alt : $a + b(x^2 + 2cx + c^2)$			A1
	$2bc = -12$ or $a + bc^2 = 7$ or $b = -2$			M1
	$2 \times -2 \times c = -12$ or $c = 3$			M1
	$a + -2 \times (3)^2 = 7$ or $a = 25$ seen			A1
				Special Cases: SC B2 for answer of $-2(x + 3)^2 + \text{constant}$ or $25 - 2(x + \text{positive constant})^2$ SC B1 for answer of $-2(x - 3)^2 + \text{constant}$
				Total 3 marks

24	Gradient of $L_2 = -10 \div -5$ ($= 2$)	40	5	M1	Method to find gradient of L_2
	$6 = 2 \times 8 + c \rightarrow c = -10$			A1	Equation for L_2
	$y = 2x - 10$ oe			A1	Finding point A and point B
	$0 = 2x - 10 \rightarrow x = 5$ or $(5, 0)$			M1	Method to find area of triangle
	$y = 2 \times -3 - 10 \rightarrow y = -16$ or $(-3, -16)$				
	(Area =) $0.5 \times 5 \times 16$ or $(0.5 \times 5 \times 10) + (0.5 \times 10 \times 3)$ or $0.5 \times 5 \times \sqrt{265} \times \sin 100.6^\circ$ or $0.5 \times \sqrt{320} \times \sqrt{265} \times \sin 15.9^\circ$				
				A1 cao	Dep on M2
				Total 5 marks	

Question	Working	Answer	Mark	Notes
25	$(N + 1)^2 = (N^2 + 2N + 1)$ and $(N - 1)^2 = (N^2 - 2N + 1)$	$N = 5x$ oe Therefore $4N = 20x$	3	M1
	$(N^2 + 2N + 1) - (N^2 - 2N + 1) = 4N$			M1 A1
	Alt: $N = 5x$ oe in both A and B	$(25x^2 + 10x + 1) -$ $(25x^2 - 10x + 1)$ $= 20x$		M1
	$(5x + 1)^2 = (25x^2 + 10x + 1)$ and $(5x - 1)^2 = (25x^2 - 10x + 1)$			M1 A1
	Alt: $A^2 - B^2 = (A + B)(A - B)$ $A + B = 2N$ and $A - B = 2$	$N = 5x$ oe Therefore $4N = 20x$		M1
	$A^2 - B^2 = 2N \times 2 = 4N$			M1 A1
				Total 3 marks

Question	Working	Answer	Mark	Notes
26	$OC = 3a + 4b$		5	B1 Correct expression for OC
	$ON = t(3a + 4b)$			M1 Correct expressions for ON
	$ON = 3a + s(-3a + 6b)$			M1
	$t(3a + 4b) = 3a + s(-3a + 6b)$ $\rightarrow t = 0.6, s = 0.4$			A1 t or s value correct
		$ON = 1.8a + 2.4b$ oe		A1 e.g. $ON = \frac{3}{5}(3a + 4b)$
	Alt:			
	$AB = -3a + 6b$			B1 Correct expression for AB
	$AN = s(-3a + 6b)$			M1 Correct expressions for AN
	$AN = -3a + t(3a + 4b)$			M1
	$-3a + t(3a + 4b) = s(-3a + 6b)$ $\rightarrow t = 0.6, s = 0.4 \rightarrow AN = -1.2a + 2.4b$			A1 t or s value correct
	$ON = 3a + AN$	$ON = 1.8a + 2.4b$ oe		A1 e.g. $ON = \frac{3}{5}(3a + 4b)$
	Alt:			
	$OC = 3a + 4b$			B1 Correct expression for OC
	$ON : NC = 6 : 4$ (i.e 3:2)			M1
	$ON = \frac{3}{5} OC$			M2
		$ON = 1.8a + 2.4b$ oe		A1 e.g. $ON = \frac{3}{5}(3a + 4b)$
				Total 5 marks
				Total: 100 marks