GradeMax



Mark Scheme (Results)

January 2020

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

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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.

International GCSE Maths A January 2020 – Paper 2HR Mark scheme

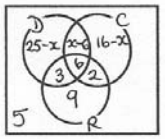
Apart from Questions 1b, 7, 16c, 19a, 21b, 24 and 25 where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1 (a)		5^{19}	1	B1
(b)			2	M1 A factor tree / division ladder of 3 or more factors (≠1), multiplying to 800, which must include 2 and 5. Condone 1 error when product ≠ 800
		$2\times2\times2\times2\times2\times5\times5$		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 ÷ 52 (=56.2..) scores M2A0
				Total 3 marks
3	$4x$ or $x - 7$		4	M1 Correct expression for B or C
	$x + 4x + x - 7 = 137$ oe			M1 Correct equation
	$x = 144 \div 6$ (=24) or $6x = 144$ or $6x - 144 = 0$			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)		3	M1
	$\sqrt{8.5^2 + 5.6^2}$			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)		3	M1
	2470 ÷ 3.6 or 2470 ÷ $3\frac{36}{60}$ or 2470 ÷ 216 × 60			M1 Allow 2470 ÷ 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	B2 Fully correct bisector with all arcs. Correct arcs can be on the same side of *AB*. B1 for all correct arcs and no bisector drawn or for a correct bisector within guidelines but no arcs. NB: On tramlines = within tramlines.
				Total 2 marks
7	(adding) $10x = -5$ or $21x + 35y = 42$ $21x - 15y = -33$ then $50y = 75$		3	M1 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			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)
		10 629		A1 Accept 10 628 → 10 629
				Total 3 marks
9	$30 = \frac{27}{1.2\,x}$		3	M1 Or for $\frac{27}{30}$ (= 0.9)
	$1.2x = \frac{27}{30}$ or $36x = 27$ or $22.5 \div 30$			M1
		0.75 oe		A1
				Total 3 marks
10 (a)		3.74×10^7	2	B2 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	B2 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 ≤, and > in place of ≥)
				Total 4 marks

Question	Working	Answer	Mark	Notes
12	180 – 2 × 66 (= 48) (360 – "48") ÷ 2 (= 156) 180 – "156" (= 24) 360 ÷ "24"		3	M1 Could be marked on diagram M1ft Final stage of calculation
	Alt : 180 – 2 × 66 (= 48) 360 ÷ (0.5 × "48")			M1 Could be marked on diagram M1ft Final stage of calculation
	Alt:180 – 2 × 66 (= 48) (360 – "48") ÷ 2 (= 156) $\frac{180\,(n-2)}{n}$ = "156" "24"n = 360 or $\frac{180\,(15-2)}{15}$ (= 156)			M1 Could be marked on diagram M1ft Final stage of calculation or embedded correct answer.
		15		A1
				Total 3 marks
13	$\frac{h}{2}$ × (7+12) × 10 = 608 oe		3	M2 M1 for $\frac{h}{2}$ × (7 + 12) × 10
		6.4		A1
				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
		6		A1
				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)	$\frac{7}{10}$ x "$\frac{5}{12}$" or "$\frac{3}{10}$" x "$\frac{7}{12}$" oe		3	M1ft	
		$\frac{7}{10}$ x "$\frac{5}{12}$" + "$\frac{3}{10}$" x "$\frac{7}{12}$" oe			M1ft	
			$\frac{56}{120}$ oe		A1	eg $\frac{7}{15}$ or 0.46....(2 dp truncated or rounded)
	(c)	"$\frac{3}{10}$" x "$\frac{5}{12}$" x $x = \frac{3}{100}$ oe		3	M1ft	A correct equation involving the unknown probability
		$x =$ "$\frac{3}{100}$" $\div$ "$\frac{15}{120}$" $(= \frac{6}{25})$ oe			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
			10		A1	
	(c)		14	1	B1ft	
						Total 6 marks

Question	Working	Answer	Mark	Notes
18	eg $9 \times 6 = 8 \times PD$ oe		2	M1 A correct equation involving *PD*
		6.75		A1 oe
				Total 2 marks
19 (a)	eg $\frac{2(4-3x)}{10} - \frac{5(3x-5)}{10} = -3$ oe or $2(4-3x) - 5(3x-5) = -3 \times 2 \times 5$		3	M1 Correct fractions over common denominator as an equation or Multiplying both sides by 10
	$8 - 6x - 15x + 25 = -30$ oe			M1 A correct equation with no denominators or brackets
		3		A1 dep on M1
(b)	$(5y + 8)(y - 5)$ (≤ 0) or $(y =) \frac{--17 \pm \sqrt{(-17)^2 - 4 \times 5 \times -40}}{2 \times 5}$		3	M1 Correct method to solve 3 term quadratic – factorising or correct use of formula
	$-1.6, 5$ oe			A1 Correct critical values
		$-1.6 \leq y \leq 5$ oe		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 $A +$ "$(\frac{13^2}{9^2})$" $A = 1800$			M1ft Dep on previous M1
	eg "$\frac{250}{81}$" $A = 1800$			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 e.g. $2^{2n} = 2^{15y-5y-2}$
	$5y + 2 = 15y - 2n$ oe			M1 Correct equation using the powers
		$n = 5y - 1$		A1 Dep on M2 (accept $5y - 1$)
				Total 7 marks

22	$(2865 =) \ {}^{30}_{2} (2 \times -6 + 29d)$		4	M1 Correct expression for sum of 30 terms
	$d = 7$			A1 Correct value for d
	$-6 + 8 \times$ "7" or (nth term =) $-6 +$ "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 $-2(x^2 + 6x) + 7$		3	M1 Factorising by -2
	$-2[(x + 3)^2 - 9 - 3.5]$ or $-2[(x + 3)^2 - 9] + 7$			M1 Completing the square
		$25 - 2(x + 3)^2$		A1
	Alt : $a + b(x^2 + 2cx + c^2)$			
	$2bc = -12$ or $a + bc^2 = 7$ or $b = -2$			M1 Equating coefficients or stating value of b
	$2 \times -2 \times c = -12$ or $c = 3$			M1 Equating coefficients or stating value of c
	$a + -2 \times (3)^2 = 7$ or $a = 25$ seen			A1 Equating coefficients or stating value of a
				Special Cases: SC B2 for answer of $-2(x + 3)^2$ + constant or $25 - 2(x +$ positive constant$)^2$ SC B1 for answer of $-2(x - 3)^2$ + constant
				Total 3 marks

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

Question	Working	Answer	Mark	Notes
25	$(N + 1)^2 = (N^2 + 2N + 1)$ and $(N - 1)^2 = (N^2 - 2N + 1)$		3	M1
	$(N^2 + 2N + 1) - (N^2 - 2N + 1) = 4N$			M1 Must reach $4N$ correctly
		$N = 5x$ oe Therefore $4N = 20x$		A1 Dep. on M2. A correct conclusion (i.e. 20 "x") following fully correct working
	Alt: $N = 5x$ oe in both A and B			M1
	$(5x + 1)^2 = (25x^2 + 10x + 1)$ and $(5x - 1)^2 = (25x^2 - 10x + 1)$			M1
		$(25x^2 + 10x + 1) - (25x^2 - 10x + 1) = 20x$		A1 Dep. on M2. Subtraction of two correct brackets to reach 20 "x"
	Alt: $A^2 - B^2 = (A + B)(A - B)$ $A + B = 2N$ and $A - B = 2$			M1
	$A^2 - B^2 = 2N \times 2 = 4N$			M1
		$N = 5x$ oe Therefore $4N = 20x$		A1 Dep. on M2. A correct conclusion (i.e. 20 "x") following fully correct working
				Total 3 marks

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

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