Mark Scheme (Results)

Summer 2019

Pearson Edexcel International GCSE
In Mathematics A (4MA1)
Paper 1HR

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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, 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 to another.

International GCSE Maths
Apart from questions 5a, 10, 18a, 19, 22, 23, 24 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1	e.g. $\pi \times 8.2^2$ (= 211.24..., $\frac{1681}{25}\pi$) **or** 1.5 × 1000 (= 1500) **or** $\pi \times 8.2^2 \times 10$ (= 2112.4..., $\frac{3362}{5}\pi$)		3	M1 for a correct first step
	e.g. (1.5 × 1000) ÷ ($\pi \times 8.2^2$) (= 7.1009...) **or** (1.5 × 1000) ÷ "2112.4" × 10 oe (= 7.1009...) **or** 10 – (("2112.4" – 1.5 × 1000) ÷ ($\pi \times 8.2^2$)) (= 7.1009...)			M1 for a complete method to find the depth of the water or an answer of 2.89 – 2.91
		7.1		A1 accept 7.09 – 7.11
				Total 3 marks

2	Ext $\angle$ = 180 – 162 (= 18) oe **or** $\frac{(n-2)180}{n} = 162$ oe		3	M1
	360 ÷ "18" oe **or** 18*n* = 360			M1
		20		A1
				Total 3 marks

3	(i)		12, 18	1	B1
	(ii)		12, 14, 15, 16, 18, 20	1	B1
	(iii)		11, 13, 15, 17, 19	1	B1
					Total 3 marks

4		e.g. $4x - 8x = 17 + 13$ oe		2	M1 For collecting terms in x and number terms on either side of a correct equation
			−7.5		A1 oe e.g. $-\frac{30}{4}$
					Total 2 marks

5	(a)	e.g. 720 = 2 × 360 = 2 × 2 × 180 or 720 = 3 × 240 = 3 × 3 × 80 etc		3	M1	At least 2 correct stages in prime factorisation
		2, 2, 2, 2, 3, 3, 5			M1	condone inclusion of 1 (may be a fully correct factor tree or ladder)
			2 × 2 × 2 × 2 × 3 × 3 × 5		A1	dep on M2, accept $2^4 \times 3^2 \times 5$
	(b)		5	1	B1	
						Total 4 marks

6 (a)	4.25 × 0.08 (= 0.34) oe		3	M1	M2 for 4.25 × 1.08 oe
	4.25 + "0.34"			M1	
		4.59		A1	SC: B1 for 4.25 × 0.92 (= 3.91) oe
(b)	9.45 ÷ 108 (= 0.0875) oe		3	M1	M2 for 9.45 ÷ 1.08
	9.45 ÷ 108 × 100 oe			M1	
		8.75		A1	
					Total 6 marks

7	$7.5^2 - 6^2$ (= 20.25)		4	M1	**OR** for a correct trig statement involving one of the angles e.g. $\cos BAM = \frac{6}{7.5}$ **or** $\sin ABC = \frac{6}{7.5}$ where *M* is the midpoint of *BC*
	$\sqrt{7.5^2 - 6^2}$ (= 4.5)			M1	**OR** for a method to find one of the angles in the triangle e.g. $BAM = \cos^{-1}\left(\frac{6}{7.5}\right)(= 36.8...)$ **or** $ABC = \sin^{-1}\left(\frac{6}{7.5}\right)(= 53.1...)$
	"4.5"× 6 oe			M1	for a complete method to find the area of triangle *ABC* e.g. $2 \times \frac{1}{2} \times 7.5 \times 6 \times \sin("36.8")$ oe **or** $2 \times \frac{1}{2} \times 7.5 \times \sqrt{7.5^2 - 6^2} \times \sin("53.1")$ oe
		27		A1	cao
					Total 4 marks

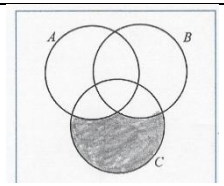
8	10 × 79.2 (= 792) **or** 3 × 68 (= 204)		3	M1
	(10 × 79.2 − 3 × 68) ÷ 7			M1
		84		A1
				Total 3 marks

9 (a)		t^6	1	B1	
(b)		w^{12}	1	B1	
(c)		$125x^3y^6$	2	B2 (B1) for 2 correct terms as part of a product	
					Total 4 marks

10	22 × 60 × 60 (= 79 200) oe **or** 22 ÷ 1000 (= 0.022) oe		3	M1	for converting from m/s to m/h **or** from m to km	M2 for 22 × 3.6 oe
	22 × 60 × 60 ÷ 1000 oe			M1	for a complete method	
		79.2		A1	oe, dep on at least M1	
						Total 3 marks

11	15 – 3 : x – 3 = 2 : 7 **or** (15 – 3) ÷ 2 (= 6)	(n =) (15 – 3) ÷ $\frac{2}{2+7}$ (= 54) where n is the total age 3 years ago		3	M1	M2 for $\frac{(15-3)\times 7}{2}$ (= 42)
	$\frac{x-3}{15-3}=\frac{7}{2}$ oe **or** 7 × "6" (= 42)	"54" × $\frac{7}{2+7}$ (= 42)			M1	
			45		A1	
						Total 3 marks

12	105 ÷ (5 × 4) (=5.25) oe **or** 105 ÷ (4 × 3) (=8.75) oe **or** 105 ÷ (3 × 5) (=7)		3	M1
	"8.75" − "5.25"			M1 dep on previous M1. If M1 gained and they have worked out 3 pressures, award M1 for their highest minus their lowest.
		3.5		A1 oe
				Total 3 marks

13 (a)			1	B1	Professional judgment required, eg allow double shading if meaning clear.
(b)		$(D \cup E) \cap F$	1	B1	oe eg $(D \cap F) \cup (E \cap F)$
					Total 2 marks

14 (a)		0.7, 0.2, 0.8, 0.1, 0.9	2	B2 (B1)	oe, all correct 2 or 3 or 4 correct probabilities
(b)	0.3 × "0.2" (= 0.06) **or** 0.7 × "0.1" (= 0.07) oe		4	M1	ft from (a) dep on probabilities being between 0 and 1, **OR** 0.3 × "0.8" (= 0.24) **or** 0.7 × "0.9" (= 0.63) oe
	0.3 × "0.2" + 0.7 × "0.1" (= 0.13) oe **or** "0.06" × 200 (= 12) **or** "0.07" × 200 (= 14)			M1	ft from (a), **OR** 0.3 × "0.8" + 0.7 × "0.9" (= 0.87) oe **or** "0.24" × 200 (= 48) **or** "0.63" × 200 (= 126)
	"0.13" × 200 oe **or** "12" + "14"			M1	ft from (a), 200 – "0.87" × 200 oe **or** (1 – "0.87") × 200 **or** 200 – "48" – "126"
		26		A1	cao
					Total 6 marks

15	(Gradient of $\mathbf{L_1}$ =) 6 ÷ 2 (=3)		4	M1	could be seen as part of an equation. Ignore constant term if candidate rearranges $\mathbf{L_1}$
	$m \times$ "3" = −1 **or** $m = -\frac{1}{"3"}$			M1	for use of $m_1m_2 = -1$ could be seen as part of an equation
	$-1 = "-\frac{1}{3}" \times 9 + c$ **or** $y - -1 = "-\frac{1}{3}"(x-9)$ **or** $c = 2$			M1	
		$y + \frac{1}{3}x = 2$		A1	oe in required form eg $3y + x = 6$, $6y + 2x = 12$ etc
					Total 4 marks

16 (a)	$3 \times 4t^2 - 2 \times 6t + 5$		2	M1	For 2 terms correct
		$12t^2 - 12t + 5$		A1	Fully correct
(b)	$24t - 12$		3	M1	Method to differentiate their v, ft a 3 term quadratic expression from (a)
	"$24t - 12$" = 6			M1	ft if previous M1 awarded
		0.75		A1	oe
					Total 5 marks

17 (a)	e.g. one correct value on the vertical scale e.g. 1 at 1 cm high **or** 1 cm^2 = 5 passengers **or** 5 small squares = 1 passenger **or** (FD =) 24 ÷ 20 (= 1.2)		3	M1	For a correct scale on the vertical axis **or** a 1 cm × 1 cm square = 5 passengers **or** other correct scale **or** one correct product or frequency (other than the 24) **or** (FD =) 24 ÷ 20 (= 1.2)
	10×0.4 (= 4) 10×1.8 (= 18) 5×6.4 (= 32) 15×2 (= 30) 20×0.8 (= 16)			M1	At least 3 correct products or frequencies (other than the 24) stated (could be seen on diagram)
		124		A1	
(b)	e.g. 0.25 × 24 + 20 × 0.8 (= 22) **or** "1.2" × 5 + 20 × 0.8 (= 22)		2	M1	ft from (a)
		$\frac{"22"}{"124"}$		A1ft	oe (0.17(741…))
					Total 5 marks

18 (a)	$(x + 2)(2x + 3) = 2x^2 + 3x + 4x + 6$ $(2x + 3)(x – 7) = 2x^2 – 14x + 3x – 21$ $(x + 2)(x – 7) = x^2 – 7x + 2x – 14$		3	M1	For multiplying a pair of brackets and getting 3 out of 4 terms correct.
	$(2x^2+7x+6)(x–7) = 2x^3–14x^2+7x^2–49x+6x–42$ $(2x^2–11x–21)(x+2) = 2x^3+4x^2–11x^2–22x–21x–42$ $(x^2–5x–14)(2x+3) = 2x^3+3x^2–10x^2–15x–28x–42$			M1dep	For multiplying the product of the first 2 brackets (ft from the 1st stage) by the 3rd bracket, and getting at least 3 out of 6 or 4 out of 8 terms correct
		$2x^3 – 7x^2 – 43x – 42$		A1	Fully correct. isw extra work as long as correct e.g. $x(2x^2 – 7x – 43) – 42$
	Alternative (all in one method)				
	$(x + 2)(2x + 3)(x – 7) =$ $2x^3 – 14x^2 + 3x^2 – 21x + 4x^2 – 28x + 6x – 42$			M2 (M1)	For at least 6 out of 8 correct terms for 4 or 5 out of 8 correct terms
		$2x^3 – 7x^2 – 43x – 42$		A1	
(b)	$p^2(2m – y) = x + m$ $2p^2m – p^2y = x + m$		3	M1	Multiplying by denominator **and** expanding bracket
	e.g. $2p^2m – m = x + p^2y$ $m(2p^2 – 1) = x + p^2y$			M1	Collect terms in m **and** factorise in a correct equation
		$m = \frac{x + p^2y}{2p^2 – 1}$		A1	oe eg $m = \frac{–x – p^2y}{1 – 2p^2}$ must have $m =$

				Total 6 marks

19	$a + 24d = 44.5$		5	M1	oe
	$\frac{30}{2}(2a+(30-1)d) = 765$ oe, eg (15(2a + 29d) = 765), (2a + 29d = 51), etc			M1	oe (may be simplified)
	e.g. 2(44.5 – 24d) + 29d = 51 oe or _2a + 48d = 89 2a + 29d = 51 oe			M1	dep on M2, a complete method to eliminate one variable, allow one arithmetic error
		26.5		A2 (A1)	dep on M2, oe dep on M2. If not A2, award A1 for $a = -3.5$ **or** $d = 2$
					Total 5 marks

20	125 **or** 10^{21n}		3	M1
	125×10^{21n}			M1
		$1.25 \times 10^{21n+2}$		A1
				Total 3 marks

21	(a)(i)		(9, 3)	1	B1
	(a)(ii)		(4, 9)	1	B1
	(b)		$a = -2$, $b = 3$	2	B2 **or** $a = 2$, $b = -3$ (B1) for $a = -2$ **or** $a = 2$ **or** $b = 3$ **or** $b = -3$
					Total 4 marks

22	$2x^2 + 3(2x + 1)^2 = 5$		5	M1	$2\left(\frac{y-1}{2}\right)^2 + 3y^2 = 5$
	eg $14x^2 + 12x - 2 = 0$ **or** if completing the square, allow $14x^2 + 12x = 2$ oe			A1	$7y^2 - 2y - 9 = 0$ **or** if completing the square, allow $7y^2 - 2y = 9$ oe
	eg $(7x - 1)(x + 1)$ or $(7x - 1)(2x + 2)$ eg $\frac{-12 \pm \sqrt{12^2 - 4 \times 14 \times -2}}{2 \times 14}$ oe eg $7\left(\left(x + \frac{3}{7}\right)^2 - \frac{9}{49}\right) = 2$ oe			M1	ft as long as M1 awarded and 3 term quadratic eg $(7y - 9)(y + 1)$ eg $\frac{2 \pm \sqrt{(-2)^2 - 4 \times 7 \times -9}}{2 \times 7}$ oe eg $7\left(\left(y - \frac{1}{7}\right)^2 - \frac{1}{49}\right) = 9$ oe
	$x = \frac{1}{7}, x = -1$ (need both)			A1	$y = \frac{9}{7}, y = -1$ (need both)
		$x = \frac{1}{7}$, $y = \frac{9}{7}$ $x = -1$, $y = -1$		A1	Dep on M1 Must be paired correctly Must be 3 sf or better (0.142857...) (1.28571...)
					Total 5 marks

23	$ABF = 180 - x$ **or** $CDF = 180 - x$		4	M1 for finding an expression for *ABF* **or** *CDF*. May be seen on diagram.
	$FDE = 180 - (180 - x)$ $(= x)$ *AFB* or *ACE* $= 180 - (180 - x) - 54$ $(= x - 54)$ *DFE* or *ACE* $= 180 - x - 32$ $(= 148 - x)$ e.g. $54 + y + 180 - x = 180$ where $AFB = y$ $32 + y + (180 - (180 - x)) = 180$ where $DFE = y$			M1 method to find *FDE* **and** *AFB* **or** method to find *FDE* **and** *DFE* **or** method to find *ACE* **or** method to find *FDE* **and** an equation for *AFB* e.g. $54 + y + 180 - x = 180$ where $AFB = y$ **or** method to find *FDE* **and** an equation for *DFE* e.g. $32 + y + (180 - (180 - x)) = 180$ where $DFE = y$ May be seen on diagram.
	e.g. $32 + x + x - 54 = 180$ **or** $54 + 180 - x + 148 - x = 180$ **or** $x - 54 = 148 - x$ oe **or** $54 + y + 180 - x = 180$ **and** $32 + y + (180 - (180 - x)) = 180$ where $AFB = DFE = y$			M1 for setting up an equation or a pair of correct simultaneous equations to solve for *x*
		101		A1 dep on at least M1
				Total 4 marks

24	$\overrightarrow{AP} = \frac{3}{4} \times 2\mathbf{c}$ $(= \frac{3}{2}\mathbf{c})$ oe		5	M1 For $\overrightarrow{AP} = \frac{3}{2}\mathbf{c}$ oe, eg could be part of $\overrightarrow{OP} = \mathbf{a} + \frac{3}{2}\mathbf{c}$ oe or on diagram
	$\overrightarrow{AC} = \mathbf{c} - \mathbf{a}$ oe **or** $\overrightarrow{CA} = \mathbf{a} - \mathbf{c}$ oe			M1
	$\overrightarrow{OQ} = \mathbf{c} + n(\mathbf{a} - \mathbf{c})$ **or** $\overrightarrow{OQ} = \mathbf{a} + n(\mathbf{c} - \mathbf{a})$ **or** $\overrightarrow{QP} = n(\mathbf{a} - \mathbf{c}) + \frac{3}{2}\mathbf{c}$			M1
	$\frac{n}{1-n} = \frac{2}{3} \Rightarrow n = \frac{2}{5}$ oe **or** $\frac{1-n}{n} = \frac{2}{3} \Rightarrow n = \frac{3}{5}$ oe **or** $\frac{n}{\frac{3}{2}-n} = \frac{2}{3} \Rightarrow n = \frac{3}{5}$ oe			M1
		3 : 2		A1 oe, dep on M3
				Total 5 marks

25	e.g. (220 – 180) + (360 – 280) (= 120)		5	M1	for a method to find angle *XYZ*. Could be seen on a diagram
	$XZ = \sqrt{3.5^2 + 6^2 - 2\times 3.5\times 6\times \cos("120")}$ (=8.3... or $\frac{\sqrt{277}}{2}$)			M1	
	$\frac{\sin YXZ}{6} = \frac{\sin("120")}{"8.32..."}$			M1	**or** $6^2 = 3.5^2 + "8.32"^2 - 2\times 3.5\times "8.32"\times \cos YXZ$
	$YXZ = \sin^{-1}\left(\frac{6\sin("120")}{"8.32..."}\right)$ (=38.6...)			M1	**or** $YXZ = \cos^{-1}\left(\frac{3.5^2 + "8.32"^2 - 6^2}{2\times 3.5\times "8.32"}\right)$ (= 38.6...)
		241.4		A1	accept 241.2 – 241.4
					Total 5 marks

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