Mark Scheme (Results)

Summer 2018

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.

International GCSE Maths
Apart from questions 4d, 17a, 17b, 18, 19, 23 (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	eg $\frac{x+10+y}{3}=11$ oe **or** $y - x = 7$ oe 3×11 (=33)		2	M1	for one correct equation in x and y **OR** finding the total of x, 10 and y **OR** two numbers with a sum of 23 **OR** two numbers with a range of 7 Note: condone non-integers for the award of M1
		$x = 8$, $y = 15$		A1	
					Total 2 marks

2	(area =) 2×1.25 (=2.5)		3	M1	
	(F =) $42 \times$ "2.5" or $42 = \frac{F}{"2.5"}$			M1	Correct substitution into pressure formula
		105		A1	cao
					Total 3 marks

Question	Working	Answer	Mark	Notes
3	eg (6.3 × 1000) ÷ 210 (= 30)		4	M1 for a method to find the number of candles, could work in grams or kg
	$\frac{2}{5}\times"30"\times13\,(=156)$			M1 for a method to find money made from the \$13 candles
	$\left(1-\frac{2}{5}\right)\times"30"\times0.8\times13\,(=187.20)$			M1 for a method to find money made from the reduced candles
		343.2(0)		A1
				Total 4 marks

4	(a)	$3c - 21 + 6c + 8$	$9c - 13$	2	M1 For 3 or 4 terms correct A1
	(b)	$x^2 - 2x + 7x - 14$	$x^2 + 5x - 14$	2	M1 For 3 correct terms or for 4 correct terms ignoring signs or for $x^2 + 5x + k$ for any non-zero value of k or for .... + $5x - 14$ A1
	(c)		$7y(4y - 3)$	2	B2 B1 for $y(28y - 21)$ or $7(4y^2 - 3y)$ or $7y(4y + k)$ or $7y(ay - 3)$
	(d)	eg $7x - 2 = 4(3x + 1)$ oe		3	M1 correct first step
		$7x - 12x = 4 + 2$ oe or $-2 - 4 = 12x - 7x$ oe			M1 for rearranging the x terms on one side and the numerical terms on the other. ft rearranging their expansion $ax + b = cx + d$ eg $7x - 2 = 12x + 4$
			$-\frac{6}{5}$		A1 oe, dep on M1
					Total 9 marks

Question	Working	Answer	Mark	Notes
5	6h 42 min = 6.7 h or $6\frac{42}{60}$ oe or 402 (mins) or 24120 (secs) **OR** 10.8(33…)(km)	4355	3	B1 for converting 6h 42min into hours or minutes or seconds **OR** finding distance travelled in 1 minute
	eg 6.7 × 650 or (402 × 650) ÷ 60 or (24120 × 650) ÷ 3600 or 6 × 650 + 42 × 10.8			M1 use of s × t, allow 6.42 × 650 (=4173)
				A1
				Total 3 marks

6	Eg $\frac{1.5}{100}\times 20\,000$ oe or 300	OR $20\,000 \times 1.015^3$	20 914	3	M1 for eg $\frac{1.5}{100}\times 20\,000$ oe or 300	OR M2 for $20\,000\times 1.015^3$ or20 000 × 1.015^4 or 21 227.27.. (M1 for 20 000 × 1.015^2 or 20 604.5)
	$\frac{1.5}{100}$ × (20 000+'300')= 304.5 $\frac{1.5}{100}$ × (20 000+'300'+'304.5') = 20913.5675				M1 for completing method	
						Accept 1 + 0.015 as equivalent to 1.015 throughout
						SC: If no other marks gained, award M1 for 20 000 × 1.045 oe or 20900 or 900
					A1	Answers in range 20 913– 20 914
						Total 3 marks

Question	Working	Answer	Mark	Notes
7 (a)		$5y^4$	2	B2 B1 for fully simplifying terms in *x* or terms in *y*
(b)	$h - f = 3e$ or $\frac{h}{3} = e + \frac{f}{3}$ or $\frac{h-f}{3}$	$e = \frac{h-f}{3}$	2	M1
				A1 oe, accept $e = \frac{f-h}{-3}$
				Total 4 marks

8	$160^2 + 200^2$ (=65600)		3	M1
	$\sqrt{160^2 + 200^2}$			M1
		256		A1 accept 256 – 256.2
				Total 3 marks

9	Interior angle of pentagon (180 × 3) ÷ 5 (= 108) oe		4	M1 or exterior angle of pentagon = $\frac{360}{5}$ $(=72)$
	Interior angle of octagon (180 × 6) ÷ 8 (= 135) oe			M1 or exterior angle of octagon = $\frac{360}{8}$ (= 45)
	(*CBF* =) 360 – ("108" + "135") (= 117)			M1 (*CBF* =) "72" + "45" (= 117)
		31.5		A1
				Total 4 marks

Question	Working	Answer	Mark	Notes
10	24.3 – 16 (= 8.3)		4	M1 Forming a right angled triangle with 24.3 – 16 on one side, 8.3 may be seen on diagram
	$\tan y = \frac{12.5}{"8.3"}$ or $\tan z = \frac{"8.3"}{12.5}$ **OR** $\sqrt{"8.3"^2 + 12.5^2}$ (= 15.004…) **and** $\sin y = \frac{12.5}{"15.0"}$ or $\sin z = \frac{"8.3"}{"15.0"}$ or $\cos y = \frac{"8.3"}{"15.0"}$ or $\cos z = \frac{12.5}{"15.0"}$			M1 for a correct trig statement involving angle *CDE* or *DCE* where *E* is on the line *AD* and *CE* is perpendicular to *AD*
	$\tan^{-1}\left(\frac{12.5}{"8.3"}\right)(= 56.415\ldots)$ or $\tan^{-1}\left(\frac{"8.3"}{12.5}\right)(= 33.584\ldots)$ or $\sin^{-1}\left(\frac{12.5}{"15.0"}\right)(= 56.415\ldots)$ or $\sin^{-1}\left(\frac{"8.3"}{"15.0"}\right)(= 33.584\ldots)$ or $\cos^{-1}\left(\frac{"8.3"}{"15.0"}\right)(= 56.415\ldots)$ or $\cos^{-1}\left(\frac{12.5}{"15.0"}\right)(= 33.584\ldots)$			M1 complete method to find angle *CDE* or *DCE*
		123.6		A1 123.5 – 123.6
				Total 4 marks

Question	Working	Answer	Mark	Notes
11 (a)		$100 < m \leq 200$	1	B1
(b)		10, 46, 80, 100, 115, 120	1	B1
(c)		Correct cumulative frequency graph	2	B2 fully correct cf graph – points at ends of intervals and joined with curve or line segments If not B2 then B1(ft from a table with only one arithmetic error) for 5 or 6 (ft from a table with only one arithmetic error) of their points at ends of intervals and joined with curve or line segments **OR** for 5 or 6 points plotted correctly at ends of intervals not joined **OR** for 5 or 6 of their points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with smooth curve or line segments
(d)	eg reading of 155 and 350 stated or indicated on graph	175 – 205	2	M1ft For use of 30 and 90, or 30.25 and 90.75, or ft from a cf graph provided method is shown. A1ft from their cf graph
(e)		12 or 13	2	M1 For reading off cf from money spent at £450 (108 ft) ft from cf graph A1
				Total 8 marks

Question	Working	Answer	Mark	Notes
12	eg (*COA*=) 360 – (2 × 90 + 74) (=106) or (*COA*=) 180 – 74 (=106) or *OAB* = 90 or *OCB* = 90		3	M1 Fully correct method to find *COA* or *OAB* or *OCB*
	"106" ÷ 2			M1
		53		A1 values may be seen on diagram throughout
				Total 3 marks

13	eg $m = \frac{1}{2}$ or $y = \frac{1}{2}x + c$		4	M1 for gradient = $\frac{1}{2}$
	eg $7 = \frac{1}{2} \times 4 + c$ or $y - 7 = \frac{1}{2}(x - 4)$			M1 for substituting (4,7) into an equation with gradient = $\frac{1}{2}$
	eg $\frac{1}{2}x + 5 = 0$ or $-7 = \frac{1}{2}(x - 4)$			M1 Inputting $y = 0$ into their correct equation
		(−10, 0)		A1 SC B2 for an answer of (18,0) or (0.5,0) oe or (7.5,0) oe
				Total 4 marks

Question	Working	Answer	Mark	Notes
14	$2^7 = 4^{2x} \times 2^x$ or $128 = (2^2)^{2x} \times 2^x$	1.4	3	M1 Replacing 128 by 2^7 or 4 by 2^2
	$7 = 2(2x) + x$			M1
				A1 oe
				Total 3 marks

15	(i)		19	1	B1
	(ii)		5	1	B1
	(iii)		29	1	B1
					Total 3 marks

Question	Working	Answer	Mark	Notes
16		$\frac{25}{56}$	4	M1 for $\frac{a}{8}\times\frac{b}{7}\times\frac{c}{6}$ where $a < 8$, $b < 7$, $c < 6$
	eg P(o, o, o) = $\frac{5}{8}\times\frac{4}{7}\times\frac{3}{6}\left(=\frac{60}{336}=\frac{5}{28}=0.178(571...)\right)$ or P(e, e, o) = $\frac{3}{8}\times\frac{2}{7}\times\frac{5}{6}\left(=\frac{30}{336}=\frac{5}{56}=0.0892(857...)\right)$			M1 for a complete method to find P(o, o, o) or P(o, e, e) or P(e, o, e) or P(e, e, o)
				M1 for a complete method to find P(o, o, o) **and** at least one of P(o, e, e), P(e, o, e), P(e, e, o)
				A1 oe $\frac{150}{336}$, 0.446(428571..) SC B2 for $\frac{260}{512}\left(=\frac{65}{128}=0.507(8125)\right)$, B1 for $\frac{170}{512}\left(=\frac{85}{256}=0.332(03125)\right)$
				Total 4 marks

Question	Working	Answer	Mark	Notes
17 (a)	eg $x = 0.4\dot{3}\dot{6}$ and $100x = 43.\dot{6}\dot{3}$ or $10x = 4.\dot{3}\dot{6}$ and $1000x = 436.\dot{3}\dot{6}$		2	M1 eg two decimals that when subtracted give a finite decimal
	$99x = 43.2$, $x = \frac{43.2}{99}$ or $990x = 432$, $x = \frac{432}{990}$	show		A1 for completing the 'show that' arriving at given answer from correct working.
(b)			3	M1 for $\sqrt{20} = 2\sqrt{5}$ and $\sqrt{80} = 4\sqrt{5}$ **or** $\frac{\sqrt{20}+\sqrt{80}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ or $\frac{\sqrt{20}+2\sqrt{20}}{\sqrt{3}}$
				M1dep for $\frac{6\sqrt{15}}{3}$ or $2\sqrt{15}$ or $\frac{3\sqrt{60}}{3}$ oe
		$\sqrt{60}$		A1 dep on M2, accept $a = 60$
				Total 5 marks

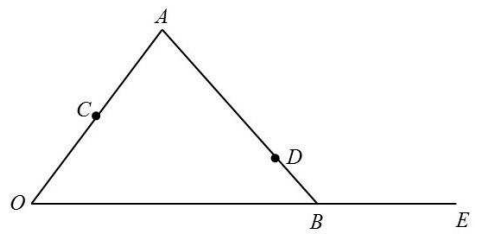
Question	Working		Answer	Mark	Notes
18	$2(2y - 3)^2 + 3y^2 = 14$ or	$2x^2 + 3\left(\frac{x+3}{2}\right)^2 = 14$		5	M1 correct first step eg substitution
	$11y^2 - 24y + 4 = 0$	$11x^2 + 18x - 29 = 0$			A1 for a correct simplified quadratic
	$(11y - 2)(y - 2)\ (=0)$ or $\frac{24 \pm \sqrt{(-24)^2 - 4\times11\times4}}{2\times11}$	$(11x + 29)(x - 1)\ (=0)$ or $\frac{-18 \pm \sqrt{18^2 - 4\times11\times-29}}{2\times11}$			M1 (dep on M1) first step to solve their 3 term quadratic
	$y = \frac{2}{11}$ or $y = 2$ (need both)	$x = \frac{-29}{11}$ or $x = 1$(need both)			A1
			$x = \frac{-29}{11}$, $y = \frac{2}{11}$ $x = 1$, $y = 2$		A1 Dep on first M1 Must be paired correctly Must be 2 dp or better
					Total 5 marks

Question	Working	Answer	Mark	Notes	
19	8.35, 8.45, 6.25, 6.35, 0.265, 0.275		3	M1	For sight of 8.35, 8.45, 6.25, 6.35, 0.265 or 0.275
	$(a =)\frac{8.45-6.25}{0.265}$			M1	$a=\frac{UB-LB_1}{LB_2}$ Where $8.4<UB\leq 8.45$ **and** $6.25\leq LB_1<6.3$ **and** $0.265 \leq LB_2 < 0.27$
		8.3		A1	8.3(018867...) dep on M2
					Total 3 marks

20	eg $(4x + 3)(x – 2)$ or $(x =) \frac{-(-5)\pm\sqrt{(-5)^2-4\times4\times(-6)}}{2\times4}$		4	M1	first step to finding the critical values
	$(x =) -\frac{3}{4}$ and 2			A1	for two correct critical values
				M1	(dep on two critical values having been found) for a diagram showing the inequalities **OR** $x < a$ and $x > b$ where a is their lower critical value and b is their upper critical value **OR** $x > 2$ **OR** $x < \frac{-3}{4}$ **OR** $\frac{-3}{4} > x > 2$
		$x < -\frac{3}{4}$ $x > 2$		A1	for both correct inequalities
					Total 4 marks

Question	Working	Answer	Mark	Notes
21 (a)		(−2, −2), (1, 6), (4, −2) Plotted and joined	2	B2 Fully correct graph- professional judgment required. (B1 for (1, 6) plotted **OR** (−2, −2) and (4, −2) plotted)
(b)		(2, −1), (−1, 3) (−4, −1) Plotted and joined	2	B2 Fully correct graph – professional judgment required. (B1 for 2 of the 3 points plotted) SC B1 for a correct reflection in the *x*-axis
				Total 4 marks

22	$\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{2(2x-5)-3(x-3)}{(x-3)(2x-5)}$ $\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{x-1}{(x-3)(2x-5)}$ $\frac{2x+5}{(5x+7)(x-3)}$	$\frac{2x+5}{(5x+7)(x-3)}$	4	M1 For $4x^2 - 25 = (2x + 5)(2x - 5)$ or $5x^2 + 2x - 7 = (5x + 7)(x - 1)$ M1 $\frac{2}{x-3} - \frac{3}{2x-5} = \frac{2(2x-5)-3(x-3)}{(x-3)(2x-5)}$ oe M1 $\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{x-1}{(x-3)(2x-5)}$ oe may be partially simplified A1 Denominator may be expanded eg $\frac{2x+5}{5x^2-8x-21}$ isw for incorrect denominator expansion
				Total 4 marks

Question	Working	Answer	Mark	Notes
23	 $\overrightarrow{AB}$ = **b** – **a** or $\overrightarrow{BA}$ = **a** – **b**	Correct simplified vectors for two of $\overrightarrow{CD}, \overrightarrow{DE}, \overrightarrow{CE}$ with a correct explanation	5	M1 Correct diagram (only points needed, condone missing vector labels) **OR** for finding $\overrightarrow{AB}$ or $\overrightarrow{BA}$ - may be seen as part of later working
	$\overrightarrow{AD} = \frac{3}{4}$ (**b** – **a**) **or** $\overrightarrow{DA} = \frac{3}{4}$ (**a** – **b**) **or** $\overrightarrow{DB} = \frac{1}{4}$ (**b** – **a**) **or** $\overrightarrow{BD} = \frac{1}{4}$ (**a** – **b**)			M1 method to find $\overrightarrow{AD}$ **or** $\overrightarrow{DA}$ **or** $\overrightarrow{DB}$ **or** $\overrightarrow{BD}$ - may be seen as part of later working
	$\overrightarrow{CD} = \frac{1}{2}$**a** + $\frac{3}{4}$ (**b** – **a**) (= $\frac{3}{4}$ **b** – $\frac{1}{4}$**a**) **or** $\overrightarrow{DE} = \frac{1}{4}$ (**b** – **a**) + $\frac{1}{2}$**b** (= $\frac{3}{4}$ **b** – $\frac{1}{4}$**a**) **or** $\overrightarrow{CE} = -\frac{1}{2}$**a** + **b** + $\frac{1}{2}$**b** (= $\frac{3}{2}$ **b** – $\frac{1}{2}$**a**)			M1 oe, method to find $\overrightarrow{CD}$ or $\overrightarrow{DE}$ or $\overrightarrow{CE}$
				M1 A correct vector expression in terms of **a** and **b** for two of $\overrightarrow{CD}, \overrightarrow{DE}, \overrightarrow{CE}$
				A1 A correct conclusion eg $\overrightarrow{CD}$ = $\overrightarrow{DE}$ so *CDE* is a straight line $\overrightarrow{CE}$ = 2$\overrightarrow{CD}$ so *CDE* is a straight line $\overrightarrow{CE}$ = 2$\overrightarrow{DE}$ so *CDE* is a straight line
				Total 5 marks

Question	Working	Answer	Mark	Notes
24 (a)		$11 - (x + 2)^2$	2	M1 For $11 - (x + q)^2$ or $p - (x + 2)^2$
				A1 fully correct, accept $p = 11$, $q = 2$
(b)	$(y + 3 + 2)^2 = 11$ or $11 - (y + 3 + 2)^2$		3	M1 substituting $x = y + 3$ into their $p - (x + q)^2$
	$y + 3 + 2 = \pm\sqrt{11}$			M1
		$-5 \pm \sqrt{11}$		A1 Both answers correct, ft their answer from (a) eg $-(3 + \text{"}q\text{"}) \pm \sqrt{\text{"p"}}$
ALT (b)	**Alternative scheme**			M2 for $-y^2 - 10y - 14 = 0$ or $y^2 + 10y + 14 = 0$
		$-5 \pm \sqrt{11}$		A1 cao, both values correct
(c)		$(-1, 3)$	1	B1 cao
				Total 6 marks

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