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Mark Scheme (Results)

November 2020

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

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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 7(a), 12, 17, 19 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method

Q	Working	Answer	Mark	Notes
1 (a)		2, 4, 6, 12	1	B1
(b)		5, 7, 8, 9, 10, 11, 13, 14	1	B1
(c)			2	M1 for $\frac{a}{14}$ with $a < 14$ **or** $\frac{3}{b}$ with $b > 3$ **or** for 3 and 14 used with incorrect notation e.g. 3 : 14
		$\frac{3}{14}$		A1 for $\frac{3}{14}$ oe **or** 0.214(…)
				Total 4 marks

2	15 × 60 × 60 (= 54 000) oe **or** $\frac{60}{12}$ × 60 × 15 (= 4500) oe **or** $5 \times \frac{60}{12} \times 60$ (= 1500) oe		4	M1	M2 for $\frac{15 \times 60 \times 60 \times 5}{12}$ (= 22 500)
	'54000' ÷ 12 × 5 (= 22 500) oe **or** '4500' × 5 (= 22 500) oe **or** '1500' × 15 (=22 500) oe			M1	
	'22 500' × 0.002 oe			M1	dep on M2 for a complete method
		45		A1	
					Total 4 marks

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3	$\begin{array}{\|c\|c\|c\|c\|c\|c\|c\|}\hline \boldsymbol{x} & -2 & -1 & 0 & 1 & 2 & 3 \\ \hline \boldsymbol{y} & 15 & 11 & 7 & 3 & -1 & -5 \\ \hline \end{array}$ (−2, 15) (−1, 11) (0, 7) (1, 3) (2, −1) (3, −5)	Correct line between $x = -2$ and $x = 3$	3	B3	for a correct line between $x = -2$ and $x = 3$ (B2 for a correct straight line segment through at least 3 of (−2, 15) (−1, 11) (0, 7) (1, 3) (2, −1) (3, −5) **or** for all of (−2, 15) (−1, 11) (0, 7) (1, 3) (2, −1) (3, −5) plotted but not joined) (B1 for at least 2 correct points stated (may be in a table) **or** plotted **or** for a line drawn with a negative gradient through (0, 7) **or** for a line with a gradient of −4)
					Total 3 marks

4	$\frac{x+10}{2} = 9$ **or** $x = 8$		4	M1	(indep)
	$\frac{4+7+x+10+y+y}{6} = 11$ oe **or** '66' – 4 – 7 – 10 (= 45)			M1	where x may be a number $7 < x < 10$
	(y =) (6 × 11 – 4 – 7 – 10 – '8') ÷ 2			M1	ft their median provided $7 < x < 10$ for a fully correct method
		$x = 8$ and $y = 18.5$ oe		A1	
					Total 4 marks

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5	(a)		0.0057	1	B1
	(b)		8×10^5	1	B1
	(c)	$\frac{273000}{6\times10^{-2}}$		2	M1 for 273 000 **or** digits 455
			4 550 000		A1 for 4 550 000 or 4.55×10^6 oe
					Total 4 marks

6	100 ÷ 28 440 (= 0.0035…) **or** 28 440 ÷ (60 × 60) (= 7.9)		3	M1
	'0.0035...' × 60 × 60 **or** 100 ÷ '7.9'			M1
		13		A1 for 12.65 – 13
				Total 3 marks

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7	(a)	$20 - 5x\ (= 7 - 3x)$		3	M1	for expansion of bracket
		E.g. $20 - 7 = -3x + 5x$ or $-5x + 3x = 7 - 20$			M1	ft from a 4-term equation for a correct process of isolating terms in x on one side of the equation and numbers on the other side
			6.5 oe		A1	dep on M1 awarded and from correct working
	(b)			2	M1	for any **correct** partial factorisation with at least 2 factors, one of which must be a letter **or** the correct common factor with no more than 1 error inside the bracket
			$8m^2\ g^3(2m + 3g^2)$		A1	
	(c)(i)	$(y \pm 6)(y \pm 8)$		2	M1	
			$(y - 8)(y + 6)$		A1	
	(c)(ii)		8, −6	1	B1	**must** ft from their factors in (c)(i)
						Total 8 marks

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8	(10 – 2) × 180 oe (= 1440) **or** (6 – 2) × 180 oe (= 720)		4	M1	for a method to find the sum of the interior angles of a decagon or a hexagon
	'1440' – 148 – 2×150 – 2×168 – 2×134 – 2×125 (=138) **or** **'**1440' – 1302 (= 138) **or** '720' – 148÷2 – 150 – 168 – 134 – 125 (= 69) **or** '720' – 651 (= 69)			M1	Allow omission of one angle
	360 – '138' **or** 360 – 2 × '69'			M1	
		222		A1	
	Alternative method (exterior angles)				
	360 – 2×(180 – 125) – 2×(180 – 134) – 2×(180 – 168) – 2×(180 – 150) – (180 – 148) **or** 360 – 2×55 – 2×46 – 2×12 – 2×30 – 32		4	M2	If not M2 then award M1 for at least 3 or (180 – 125) , (180 – 134) , (180 – 168) , (180 – 150), (180 – 148) **or** at least 3 of 55, 46, 12, 30, 32
	180 + '42'			M1	
		222		A1	
					Total 4 marks

9	E.g. 1 − 0.2 (= 0.8) **or** 100(%) − 20(%) (= 80(%)) **or** $\frac{1080}{80}$ (= 13.5) oe		3	M1
	E.g. 1080 ÷ 0.8 or 1080 ÷ 80 × 100 or '13.5' × 100 1080 × 100 ÷ 80			M1 for a complete method
		1350		A1
				Total 3 marks

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10	(a)		2×3^{37}	1	B1
	(b)	$2 \times 3^{43} \times 2^4 \times 3^{37}$ **or** $2^5 \times 3^p$ ($p \neq 80$) **or** $2^q \times 3^{80}$ ($q \neq 5$)		2	M1
			$2^5 \times 3^{80}$		A1
					Total 3 marks

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11	(AX =) (17.6 – 8.4) ÷ 2 (= 4.6)		6	M1	where X is the foot of the perpendicular from B to AD
	0.5 × (8.4 + 17.6) × h = 179.4 **or** 0.5 × '4.6' × h + 0.5 × '4.6' × h + 8.4 × h = 179.4 **or** 13 × h = 179.4			M1	
	(h =) 179.4 ÷ '13' (=13.8) **or** (h =) 358.8 ÷ '26' (=13.8) oe			M1	
	$\tan ABX = \frac{'4.6'}{'13.8'}$ **or** $\tan BAX = \frac{'13.8'}{'4.6'}$			M1	ft their h dep on second M1 $(AB =)\sqrt{'4.6'^2+'13.8'^2} = \sqrt{211.6}$ = (14.546…) **and** one from $\sin ABX = \frac{'4.6'}{'\sqrt{211.6}'}$ or $\sin BAX = \frac{'13.8'}{'\sqrt{211.6}'}$ or $\cos ABX = \frac{'13.8'}{'\sqrt{211.6}'}$ or $\cos BAX = \frac{'4.6'}{'\sqrt{211.6}'}$ or $\sin ABX = \frac{'4.6'\times\sin 90}{'\sqrt{211.6}'}$ or $\cos ABX = \frac{'\sqrt{211.6}'+'13.8'^2-'4.6'^2}{2\times'\sqrt{211.6}'\times'13.8'}$
	(ABX =) $\tan^{-1}\left(\frac{'4.6'}{'13.8'}\right)$ (= 18.4) **or** (BAX =) $\tan^{-1}\left(\frac{'13.8'}{'4.6'}\right)$ (= 71.6)			M1	
		108.4		A1	awrt 108.4
					Total 6 marks

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12	**Elimination** E.g. $21x-6y=102$ $21x+35y=-21$ $(-41y=123)$ or $35x-10y=170$ $6x+10y=-6$ $(41x=164)$	**Substitution** E.g. $3\left(\frac{34+2y}{7}\right)+5y=-3$ or $3x+5\left(\frac{7x-34}{2}\right)=-3$ or $7\left(\frac{-3-5y}{3}\right)-2y=34$ or $7x-2\left(\frac{-3-3x}{5}\right)=34$		4	M1	for a correct method to eliminate x or y: coefficients of x or y the same **and** correct operation to eliminate selected variable (condone 1 arithmetical error) **or** for correctly writing x or y in terms of the other variable and correctly substituting
					A1	dep on M1 for $x = 4$ or $y = -3$
	E.g. $7x-2\times-3=34$				M1	dep on M1 for substitution of found variable **or** repeating the steps in first M1 for the second variable
			$x = 4$ $y = -3$		A1	cao A correct answer without working scores no marks
						Total 4 marks

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13	$8000\times\left(\frac{100+x}{100}\right)^6=8877.62$ oe **or** $8000\times\left(1+\frac{x}{100}\right)^6=8877.62$ oe **or** $8000\times(1+x\%)^6=8877.62$ **or** $8000\times y^6=8877.62$ oe		3	M1
	$\left(\frac{8877.62}{8000}\right)^{\frac{1}{6}}$ (=1.0175…) or $(1.1097...)^{\frac{1}{6}}$ (=1.0175…)			M1
		1.75		A1
				Total 3 marks

14	$F=\frac{k}{v^2}$ **or** $Fv^2=k$ oe		3	M1	(NB. Not for $F=\frac{1}{v^2}$) Constant of proportionality must be a symbol such as k	M2 for $6.5=\frac{k}{4^2}$ oe
	$6.5=\frac{k}{4^2}$ **or** $k = 6.5 \times 4^2$ **or** $k = 104$			M1	For substitution of F and v into a correct formula	
		$F=\frac{104}{v^2}$		A1	Award 3 marks if $F=\frac{k}{v^2}$ is on the answer line and the value of $k = 104$ is found	
						Total 3 marks

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15	(a)		$\frac{2}{5}, \frac{3}{5}$ oe	2	B1	correct probabilities for spinner **A**
			$\frac{4}{5}, \frac{1}{5}, \frac{4}{5}, \frac{1}{5}$ oe		B1	correct probabilities for spinner **B**
	(b)	$'\frac{2}{5}' \times '\frac{4}{5}' \left(= \frac{8}{25}\right)$ **or** $'\frac{2}{5}' \times '\frac{1}{5}' \left(= \frac{2}{25}\right)$ **or** $'\frac{3}{5}' \times '\frac{4}{5}' \left(= \frac{12}{25}\right)$ **or** $'\frac{3}{5}' \times '\frac{1}{5}' \left(= \frac{3}{25}\right)$ oe		3	M1	ft from (a) provided 0 < probability <1
		$1 - '\frac{8}{25}'$ **or** $'\frac{2}{25}' + '\frac{12}{25}' + '\frac{3}{25}'$ **or** $'\frac{2}{25}' + '\frac{3}{5}'$ oe			M1	ft from (a) for a complete method
			$\frac{17}{25}$		A1	oe
						Total 5 marks

16	(a)(i)		122	1	B1	
	(a)(ii)		reason	1	B1	(dep on a correct answer or a correct method seen for (i)) Opposite angles in a cyclic quadrilateral sum to 180°
	(b)	360 – 2 × 58 or 2 × '122'		2	M1	ft from (a)
			244		A1	
						Total 4 marks

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17	5025 **or** 5.025 **or** 4975 **or** 4.975		4	B1	Accept $5024.\dot{9}$ for 5025 or $5.024\dot{9}$ for 5.025
	1.845×10^{-3} oe **or** 1.835×10^{-3} oe			B1	Accept $1.844\dot{9} \times 10^{-3}$ for 1.845×10^{-3}
	$\frac{5.025}{1.835\times10^{-3}} (= 2738.4...)$ oe			M1	for correct substitution into $\frac{m_{UB}}{v_{LB}}$ where $5 < m_{UB} \leq 5.025$ **and** $1.835 \times 10^{-3} \leq v_{LB} < 1.84 \times 10^{-3}$
		2738.4		A1	dep on correct working
					Total 4 marks

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18	(a)	35 ÷ 10 (=3.5), 45 ÷ 15 (=3), 75 ÷ 15 (=5), 40 ÷ 20 (=2), (8 ÷ 10) = 0.8		3	M1	for any two correct fd **or** two correct bars drawn of different widths
		35 ÷ 10 (=3.5) **and** 45 ÷ 15 (=3) **and** 75 ÷ 15 (=5) **and** 40 ÷ 20 (=2) **and** (8 ÷ 10) = 0.8			M1	for all correct fd **or** at least 3 correct bars drawn
					A1	for a fully correct histogram with 'frequency density' (or fd) and scale on the axis labelled or appropriate key (SC: B2 for all five bars drawn of correct width with heights in the correct ratio) (SC: B1 for three bars drawn of correct width with heights in the correct ratio)
	(b)	$10 \times 5 + 40 + 8$ or $\frac{2}{3} \times 75 + 40 + 8$		2	M1	ft from their histogram in (a) for a correct method
			98		A1	
						Total 5 marks

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19	$\frac{6}{3-\sqrt{7}}\times\frac{3+\sqrt{7}}{3+\sqrt{7}}$ or $\frac{6}{3-\sqrt{7}}\times\frac{-3-\sqrt{7}}{-3-\sqrt{7}}$			M1
	$\frac{6(3+\sqrt{7})}{3^2-7}$ **or** $\frac{6(3+\sqrt{7})}{2}$ **or** $\frac{6(-3-\sqrt{7})}{-3^2+7}$ **or** $\frac{6(-3-\sqrt{7})}{-2}$			M1 (numerator may be expanded or denominator may be 4 terms which need to be all correct)
		$9+3\sqrt{7}$	3	A1 dep on M2 for $9+3\sqrt{7}$ **or** $3(3+\sqrt{7})$ from correct working
				Total 3 marks

20	$\sqrt{\frac{300}{108}}$ **or** $\sqrt{\frac{108}{300}}$ **or** $\sqrt{\frac{25}{9}}$ oe **or** $\sqrt{\frac{9}{25}}$ oe **or** $\left(\frac{300}{108}\right)^3=\left(\frac{V}{135}\right)^2$ oe			M1 for a correct linear scale factor (fraction or ratio) **or** for the use of $\left(\frac{A_1}{A_2}\right)^3=\left(\frac{V_1}{V_2}\right)^2$
	$135\times\left(\sqrt{\frac{300}{108}}\right)^3$ oe **or** $\sqrt{\frac{300^3}{108^3}\times135^2}$ **or** $\sqrt{390625}$			M1
		625	3	A1
				Total 3 marks

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21	$\left(\frac{9x^2-4}{3x^2-13x-10}=\right)\ \frac{(3x+2)(3x-2)}{(3x+2)(x-5)}$			M1 for either $(3x + 2)(3x – 2)$ **or** $(3x + 2)(x – 5)$	M2 for $\frac{9x^2-4}{(9x^2-4)(x-5)} = \frac{1}{(x-5)}$
	$\left(\frac{9x^2-4}{3x^2-13x-10}=\right)\ \frac{(3x+2)(3x-2)}{(3x+2)(x-5)}$			M1 for $(3x + 2)(3x – 2)$ **and** $(3x + 2)(x – 5)$	
	E.g. of denominators $(3x-2)(3x^2-13x-10)(x-1)$ **or** $(3x-2)(3x+2)(x-5)(x-1)$ **or** $9x^4-54x^3+41x^2+24x-20$ **or** $(3x+2)(x-5)(x-1)$ **or** $3x^3-16x^2+3x+10$ **or** $(3x-2)(x-5)(x-1)$ **or** $3x^3-20x^2+27x-10$ **or** $(x-5)(x-1)$ **or** x^2-6x+5			M1	(indep) ft their fractions for use of a correct common denominator for 2 fractions with **algebraic** denominators NB: fractions need not be simplified
	$\frac{x-1-7(x-5)}{(x-5)(x-1)}$ **or** $\frac{x-1-7x+35}{(x-5)(x-1)}$ **or** $\frac{x-1-7(x-5)}{x^2-6x+5}$ **or** $\frac{x-1-7x+35}{x^2-6x+5}$ oe			M1	for a **correct** fraction with a **correct quadratic** denominator – may or may not be expanded which leads to a correct answer
		$\frac{2(17-3x)}{(x-5)(x-1)}$	5	A1	accept $\frac{34-6x}{(x-5)(x-1)}$ oe; if denominator is expanded then it must be correct
					Total 5 marks

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22	$y=-\frac{7}{2}x(+10)$ **or** (gradient =) $-\frac{7}{2}$		4	B1	for correct gradient which may be seen in an equation. Condone $-\frac{7}{2}x$
	$'-\frac{7}{2}'m=-1$ **or** $(m=)'\frac{2}{7}'$			M1	ft their gradient for use of $m_1 \times m_2 = -1$
	$-11='\frac{2}{7}'\times 6+c$ **or** $y--11='\frac{2}{7}'(x-6)$ oe			M1	ft dep on M1
		$\left(0, -\frac{89}{7}\right)$		A1	accept $\left(0, -12\frac{5}{7}\right)$ must be exact values
					Total 4 marks

23	$\left(\frac{dy}{dx}=\right)3px^2-m$		4	M1	for $3px^2$ **or** $-m$
	$3px^2-m<0$ oe			M1	ft dep on M1 for setting up an inequality with their $'3px^2'-'m'$ must be a two-term expression in the form $apx^2 \pm m$
	$\pm\sqrt{\frac{m}{3p}}$			B1	for both critical values
		$-\sqrt{\frac{m}{3p}} < x < \sqrt{\frac{m}{3p}}$		A1	may be seen as two separate inequalities
					Total 4 marks

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24	$a = 8$ $d = 7$			4	M1 can be implied
	$(S_{100} =)\frac{100}{2}(2\times 8+(100-1)\times 7)$ (= 35 450) **or** $(S_{49} =)\frac{49}{2}(2\times 8+(49-1)\times 7)$ (= 8624) **or** $(S_{50} =)\frac{50}{2}(2\times 8+(50-1)\times 7)$ (= 8975)				M1
	'35450' – '8624' **or** '35450' – '8975' + (8 + (50 – 1)×7)				M1
			26 826		A1
					Total 4 marks
	Alternative scheme				
	(u_n =) $7n + 1$	$a = 8$ and $d = 7$		4	M1 can be implied
	(u_{50} =) $7 \times 50 + 1$ (= 351) **or** (u_{100} =) $7 \times 100 + 1$ (= 701)	(u_{50} =) $8 + (50 – 1)\times 7$ (= 351)			M1
	$\frac{51}{2}('351'+'701')$	$\frac{51}{2}(2\times 351+(51-1)\times 7)$			M1
			26 826		A1
					Total 4 marks

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25	(a)		Reflection in $y = 0$	1	B1	accept alternative for $y = 0$ e.g. x axis ; if more than one transformation then B0
	(b)		U shaped curve through (2, 6) (3, 0) (5, −6) (7, 0) (8, 6)	2	B2	for a U shaped curve passing through (2, 6) (3, 0) (5, −6) (7, 0) (8, 6) If not B2 then award B1 for either 2f(x − 1) passing through at least 3 points from (2, 6) (3, 0) (5, −6) (7, 0) (8, 6) **or** 2f(x + 1) passing through (0, 6) (1, 0) (3, −6) (5, 0) (6, 6) **or** 2f(x) passing through all of (1, 6) (2, 0) (4, −6) (6, 0) (7, 6) **or** f(x – 1) passing through all of (2, 3) (3, 0) (5, −3) (7, 0) (8, 3) **or** 2f($x \pm k$) passing through all of $(1 \pm k, 6)$ $(2 \pm k, 0)$ $(4 \pm k, -6)$ $(6 \pm k, 0)$ $(7 \pm k, 6)$ **or** A clear translation of the curve using the vector $\begin{pmatrix} 1 \\ k \end{pmatrix}$
						Total 3 marks

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