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Mark Scheme (Results)

January 2021

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

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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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International GCSE Maths				
Apart from questions 14a, 21 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	6 hrs 39 mins = 6.65 (hrs) or $6\frac{39}{60}$ or $6\frac{13}{20}$ or $\frac{133}{20}$ or 399 (mins)		3	B1
	Average speed = $\frac{429}{6.65}$ oe eg $\frac{429}{399}\times 60$			M1 Use of $S = D \div T$ (use of their time in hours) [allow 429 ÷ 6.39 if B0 awarded]
		64.5		A1 Awrt 64.5
				Total 3 marks

2		3, 7, 8, 8 and one of 4 or 5 or 6	3	B3 For a list of 5 correct numbers (B2 for a list of 5 numbers with 2 of: median of 7, mode of 8, range of 5 B1 for a list of 5 or 6 numbers with 1 of: median of 7, mode of 8, range of 5)
				Total 3 marks

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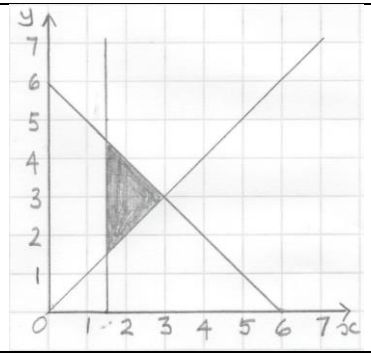
3	(a)	$520 - 465$ (= 55) **or** $\frac{520}{465}$ (=1.118…)	11.8	3	M1	
		$\frac{"55"}{465} \times 100$ **or** $100 \times$("1.118" – 1) oe			M1	
					A1	11.8 or better (11.827956...)
	(b)	0.12×550 oe (= 66)	484	3	M1 oe	M2 for 0.88×550 oe
		550 – "66"			M1	
					A1	
						Total 6 marks

4	(a)(i)		Correct line	1	B1	For $x = 1.5$ drawn
	(ii)		Correct line	1	B1	For $y = x$ drawn
	(iii)		Correct line	1	B1	For $x + y = 6$ drawn
	(b)		Correct region	1	B1	dep on B3 for correctly indicating the region **R** accept unlabelled or unshaded if clear. Shading can be 'in' or 'out'.
						Total 4 marks

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5	(a)	$8x^2 + 20x - 6x^2 + 9x$	$2x^2 + 29x$	2	M1	3 correct terms or all 4 terms condoning incorrect signs
					A1	
	(b)	eg $y^5 \times y^n = y^{19}$ or $y^{-1} \times y^n = y^{13}$ or $5 + n - 6 = 13$	14	2	M1	Use of 1 rule of indices or a correct linear equation in n
					A1	Accept y^{14}
	(c)(i)	$7t - 2t < 7 + 8$ oe eg $5t < 15$ oe	$t < 3$	2	M1	Terms in t on one side and number terms the other side – may be in an equation or the incorrect inequality sign or an answer of $t = 3$ or eg $t \geq 3$
					A1	
	(ii)		open circle at $t = 3$ and a line with an arrow to the left	1	B1ft	ft their inequality Allow a line without an arrow if it reaches to at least −5, with an arrow it can be any length
						Total 7 marks

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6	(a)		1	1	B1
	(b)	$3\times10^{125}+2\times10^{124}$ **or** digits 1024×10^{n} oe		3	M1
		32×10^{124} **or** $3\times10^{125}+0.2\times10^{125}$ **or** $30\times10^{124}+2\times10^{124}$			M1 oe 'correct' answer in incorrect form.
			3.2×10^{125}		A1
					Total 4 marks

7		5×398 (= 1990) or 6×401 (= 2406)		3	M1 Correct total for 5 or for 6 cocoa pods
		"2406" – "1990"			M1 (M2 for $398+6\times3$ or $401+5\times3$)
			416		A1
					Total 3 marks

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8		$8^2 + 15^2$ (= 289)		5	M1
		$\sqrt{8^2 + 15^2}$ (=17)			M1
		$\pi \times \left("\frac{17}{2}"\right)^2$ (= 226.98...) **or** 0.5 × 15 × 8 (= 60)			M1
		$\pi \times \left("\frac{17}{2}"\right)^2$ – 0.5 × 15 × 8 ("226.98" – "60")			M1
			167		A1 Accept answers which round to 167
					Total 5 marks

9			$2^4 \times 3^2 \times 5^4 \times 11 \times 13$	2	B2 (B1 for 12 870 000 or correct unsimplified product or $2^m \times 3^n \times 5^p \times 11 \times 13$ with at least 1 of *m*, *n* or *p* correct or for $2^4 \times 3^2 \times 5^4$)
					Total 2 marks

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10		eg $\frac{4}{5}\times\frac{3}{7}(=\frac{12}{35})$oe **or** $0.24\times\frac{4}{7}(=\frac{96}{700})$oe **or** eg $\frac{4}{5}\times 3(=\frac{12}{5}=2.4)$ **and** $0.24\times 4(=\frac{24}{25}=0.96)$ (or 3.36) **or** eg $\frac{4}{5}\times 300(=240)$ **and** $0.24\times 400(=96)$ (or 336)		3	M1
		eg $"\frac{12}{35}"+"\frac{96}{700}"\left(=\frac{336}{700}\right)$ oe **or** $\frac{"2.4"+"0.96"}{3+4}\left(=\frac{3.36}{7}\right)$ oe **or** eg $\frac{"240"+"96"}{300+400}\left(=\frac{336}{700}\right)$ oe			M1 or 0.48 or 48% or correct unsimplified fraction eg $\frac{84}{175}$
			$\frac{12}{25}$		A1 cao
					Total 3 marks

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11		(definition of part: there are 3 parts: one part is the number, one part the letter t and one part the letter w Definition of terms: there are 6 terms: 2 number terms, 2 terms in t and 2 terms in w)		3	M1 indep	Fully correct cancellation of any two parts of their fraction at any stage of working
					M1 indep	correctly apply the negative power to the whole of their bracket (all parts or all terms) **or** correctly square all parts or terms of their bracket **or** correctly apply the negative power AND square of at least two parts (maybe 4 terms) of their bracket
			$4t^4w^2$		A1	Allow $(2t^2w)^2$ after the correct answer
		ALTERNATIVE				
			$4t^4w^2$	3	M2	2 correct terms (M1 for 1 correct term)
					A1	Allow $(2t^2w)^2$ after the correct answer
						Total 3 marks

12		$13 - 4$		2	M1 For selecting 4 and 13
			9		A1
					Total 2 marks

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13	(a) (i)		62	3	B1
	(a) (ii)		118		B1ft 180 – their (a)(i)
	(b)		62		B1
					Total 3 marks

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14	(a)	eg $20\times\frac{9a-7}{5}-20\times\frac{3a-7}{4}=20\times4.55\,(=91)$ or eg $4(9a-7)-5(3a-7)=20\times4.55$ or eg $\frac{4(9a-7)}{20}-\frac{5(3a-7)}{20}\,(=4.55)$ or eg $\frac{4(9a-7)-5(3a-7)}{20}\,(=4.55)$		3	M1	For clear intention to multiply all terms by 20 (or 4 × 5) or a multiple of 20 oe or to express LHS as two fractions over 20 (or 4 × 5) or a multiple of 20 oe or as a single fraction with a denominator of 20 (or 4 × 5) or a multiple of 20 oe if expanded numerator, allow one error
		eg $36a - 28 - 15a + 35 = 20 \times 4.55$ or $21a = 84$ oe			M1	Expanding brackets and multiplying by denominator with no more than one sign error
			4		A1	dep on M1
	(b)	$p^2=\frac{ac+8}{3+c}$		4	M1	for removing square root
		$3p^2+cp^2=ac+8$			M1	for multiplying by denominator and expanding in a correct equation
		$cp^2-ac=8-3p^2$ **or** $3p^2-8=ac-cp^2$			M1ft	for gathering terms in c on one side and other terms the other side ft their equation dep on 2 terms in c and two other terms
			$c=\frac{8-3p^2}{p^2-a}$		A1	or $c=\frac{3p^2-8}{a-p^2}$
						Total 7 marks

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15	(a)	63 ÷ 1.5 (= 42) **or** a correct value written on FD scale (10 small squares = FD 10) **or** 10 squares = 1 parcel or 1 big square = 2.5 parcels oe eg area = 18 × 5 + 15 × 42 + 10 × 24 + 10 × 30 + 20 × 8 (= 1420) 3.6 × 1 + 3 × 8.4 + 2 × 4.8 + 2 × 6 + 4 × 1.6 (= 56.8) (at least 3 bars correct for any method of summing area)		3	M1	For use of area related to frequency eg showing a correct unambiguous value on the frequency density scale or calculating the area in some form
		0.5 × 18 + 63 + 1 × 24 + 1 × 30 + 2 × 8 (9 + 63 + 24 + 30 + 16) oe eg "1420" ÷ 10 or "56.8" × 2.5 oe			M1	Total of 5 frequencies with just one error or Area of bars with just one error, with correct calculation to give frequency
			142		A1	
	(b)	0.75 × 24 (= 18) + 30 + 16 (= 64) oe Eg "their (a)" – (9 + 63 + 0.25 × 24) (= 64) (ft figures from (a) dep on M1 for (a))		3	M1ft	(dep on M1 in (a))if working with small squares they may get eg $\frac{640}{1420}$
		$\frac{"64"}{142}\times\frac{"63"}{141}$ (ft their value of 142 from (a))			M1	64 must come from correct working allow $\frac{"64"}{142}\times\frac{"64"}{142}$ (ft their value of 142 from (a))
			$\frac{672}{3337}$		A1	0.201 or better (0.20137…)
						Total 6 marks

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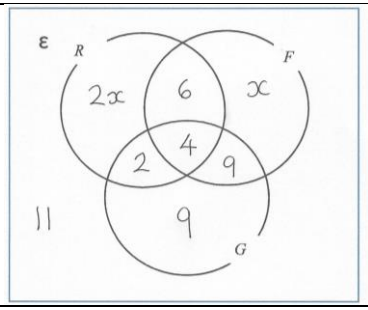
16	(a)			3	B3	For all sections completed correctly (B2 for 5 or 6 sections correct (excl *x*), B1 for 3 or 4 sections correct (excl *x*))
	(b)	$2x + 6 + x + 2 + 4 + 9 + 9 + 11 = 80$ $(80 – 6 – 2 – 4 – 9 – 9 – 11) \div 3$			M1ft	ft their Venn diagram A correct equation to find *x* or subtracting all numerical values from 80 and dividing by 3 or other fully correct method to find *x* with all sections completed
		$x = 13$			A1	correct value for *x*
			38		B1	their $2x + 12$
						Total 6 marks

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17	(a)	$\left(\frac{37+28}{2}\right)\times 20\,(=650)$		4	M1	Correct method to find area of trapezium
		$\sqrt{4.5^2+20^2}\,(=20.5)$ oe			M1	Correct method to find slanted edge *AB* oe
		2 × '650' + 2 × '20.5' × 24 + 37 × 24 + 28 × 24 (2 × '650' + 2 × 492 + 888 + 672)			M1	method to find the sum of the surface areas of at least 4 correct faces (ft their area of trapezium) ignore incorrect areas
			3844		A1	
	(b)	eg $\sqrt{24^2+(37-"4.5")^2}\,(=40.4)$ (*AF* =) $\sqrt{24^2+20^2+(37-"4.5")^2}\;(=45.08...)$		3	M1	Correct method to find diagonal from *A* to point on *HE* below *F* **or** *AF*
		$\tan x = \frac{20}{"40.4"}$ or $\sin x = \frac{20(\sin 90)}{"45.08"}$ or $\cos x = \frac{"40.4"^2+"45.08"^2-20^2}{2\times"40.4"\times"45.08"}$			M1	Correct trig statement for finding the required angle
			26.3		A1	26.3 – 26.4
						Total 7 marks

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18	(a)			4	B1	$b = 14$
		(Gradient AB =) $\frac{12}{5}$ oe or eg $\frac{10--2}{1--4}$ oe			M1	For the gradient of AB
		(Gradient BC =) $-\frac{5}{12}$ oe			M1	Ft correct use of $m_1 \times m_2 = -1$ for *their* gradient of AB or $a = 2.5$ or $c = -9.5$
			$a = 2.5$, $c = -9.5$		A1	for $a = 2.5$ and $c = -9.5$
	(b)	$(AB =) \sqrt{(1--4)^2 + (10--2)^2}$ $(= \sqrt{5^2 + 12^2}\ (=13))$		3	M1	
		$(BC =) \sqrt{(19-1)^2 + (10-2.5)^2}$ $(= \sqrt{18^2 + 7.5^2}\ (= 19.5))$ **or** $\sqrt{(19-1)^2 + (10-\text{their } a)^2}$ **or** 1.5 × "13"			M1	ft their value of a
			65		A1	
						Total 7 marks

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19		$(v =)\ 3t^2 + 10t - 8$		5	M1	For at least 2 terms differentiated correctly
		$3t^2 + 10t - 8 = 0$			M1	Their $v = 0$ dep on M1 could be implied by correct values
		$(3t - 2)(t + 4)\ (= 0)$ $(t =)\ \frac{2}{3}$ or $(t =) -4$			M1	dep on M1 for correct values for t or for $t = \frac{2}{3}$ or correct method to solve their 3 term quadratic equation: If factorising, allow brackets which when expanded give 2 out of 3 terms correct (If using formula or completing the square allow one sign error and some simplification – allow as far as eg $\frac{-10 \pm \sqrt{100+96}}{6}$ oe $3(t+\frac{5}{3})^2 - \frac{48}{3} = 0$)
		$(s =)\left(\frac{2}{3}\right)^3 + 5\times\left(\frac{2}{3}\right)^2 - 8\times\frac{2}{3} + 10$			M1	For $\frac{2}{3}$ (only) substituted into formula for s or for selecting the value from this substitution or for an answer of 7.185…
			$\frac{194}{27}$		A1	oe but numerator and denominator must be integers.
						Total 5 marks

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20	eg $0.5 \times x \times x \times \sin 60$ $\left(=\frac{\sqrt{3}}{4}x^2 = 0.433...x^2\right)$ oe where $x = PQ$ eg $0.5 \times 2n \times 2n \times \sin 60 \left(=\sqrt{3}n^2 = 1.732...n^2\right)$ oe where $2n = PQ$ or use $0.5 \times b \times h$ where $h = \sqrt{x^2-(0.5x)^2}\,(=\frac{\sqrt{3}}{2}x)$ oe		4	M1	For expression for area of triangle [using $AB = x$ and $PQ = \frac{2}{3}x$ gives $\frac{\sqrt{3}}{9}x^2 = 0.192...x^2$] (correct expression in 1 variable eg PQ)
	eg $6 \times 0.5 \times 1.5x \times 1.5x \times \sin 60$ $\left(=\frac{27\sqrt{3}}{8}x^2 = 5.845...x^2\right)$ oe eg $6 \times 0.5 \times 3n \times 3n \times \sin 60$ $\left(=\frac{27\sqrt{3}}{2}n^2 = 23.382...n^2\right)$ oe or eg $2(\frac{1}{2}\times 1.5x\times 1.5x\times \sin 120)+1.5x\times AE$ where $AE = \sqrt{(1.5x)^2+(1.5x)^2-2\times 1.5x\times 1.5x\times \cos 120}$ $\left(=\frac{27\sqrt{3}}{8}x^2 = 5.845...x^2\right)$ or use of $6 \times 0.5 \times b \times h$, finding h by Pythagoras			M1	for expression for area of hexagon [using $AB = x$ and $PQ = \frac{2}{3}x$ gives $\frac{3\sqrt{3}}{2}x^2 = 2.598...x^2$] (correct expression in 1 variable eg AB)
	eg $6 \times 0.5 \times 1.5x \times 1.5x \times \sin 60 - 0.5 \times x \times x \times \sin 60 = 72\sqrt{3}$ oe **or** $\left(\frac{27\sqrt{3}}{8}-\frac{\sqrt{3}}{4}\right)x^2 = 72\sqrt{3}$ **or** $(5.845\ldots - 0.433\ldots)x^2 = 124.7\ldots$ **or** eg $6 \times 0.5 \times 3n \times 3n \times \sin 60 - 0.5 \times 2n \times 2n \times \sin 60 = 72\sqrt{3}$ oe $\left(\frac{27\sqrt{3}}{2}-\sqrt{3}\right)n^2 = 72\sqrt{3}$ or $(23.382\ldots - 1.732\ldots)n^2 = 124.7\ldots$			M1	for a correct equation for shaded area (correct equation in 1 variable, eg PQ or x etc)
		4.8		A1	

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					Total 4 marks

21		$\frac{(5x-8)(5x+8)}{(5x+2)(x-3)} \times \frac{(x-5)(x-3)}{5x+8}$ or eg $\frac{(5x-8)(x-5)}{(5x+2)}(-(x-7))$		4	M2	For factorising at least 2 of the quadratics correctly – could be implied by 2 factors cancelled correctly (M1 For factorising at least 1 of the 3 quadratics correctly)
		$\frac{(5x-8)(x-5)-(x-7)(5x+2)}{5x+2}$ oe or $\frac{5x^2-25x-8x+40-(5x^2-35x+2x-14)}{5x+2}$ oe or $\frac{(25x^2-64)(x^2-8x+15)-(x-7)(5x^2-13x-6)(5x+8)}{(5x^2-13x-6)(5x+8)}$ oe or $\frac{(5x-8)(x^2-8x+15)-(x-7)(5x+2)(x-3)}{(5x+2)(x-3)}$ oe or $\frac{(25x^2-64)(x-5)-(x-7)(5x+2)(5x+8)}{(5x+2)(5x+8)}$ oe			M1	(indep (ft if M2 awarded)) For writing the fractions over a common denominator with or without brackets removed – need not be in simplest form Could be written as 2 separate fractions over a common denominator
			$\frac{54}{5x+2}$		A1	dep on M3
						Total 4 marks

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22		eg $(AD =)\sqrt{6^2+6^2-2\times6\times6\times\cos(50)}$ $(= 5.07\ldots)$**or** $2 \times 6\sin25$ (=5.07...) **or** $\frac{6\sin50}{\sin65}(= 5.07...)$ oe		6	M1	Correct expression for *AD* ie *AD* = … or *x* = oe
		eg 6 + 6 + $\sqrt{6^2+6^2-2\times6\times6\times\cos(50)}$ or 12 +"5.07…" (=17.0)7... or 17.1)			M1	A **correct** statement of perimeter of triangle *OAD*
		eg (arc *BC*=) $\frac{50}{360}\times\pi\times2\times(6+x)$ oe			M1	A correct statement for arc *BC* (condone missing brackets around (6 + *x*) for this mark only)
		eg $2\times"17.1"=12+2x+\frac{50}{360}\times\pi\times2\times(6+x)$ oe			M1	dep on M3 for a correct equation for *x*
		eg $2\times17.1-12-\frac{30}{18}\pi=2x+\frac{5x}{18}\pi$			M1	isolating terms in *x* in a correct equation
			5.89		A1	5.88 – 5.89
						Total 6 marks

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