International GCSE in Mathematics A - Paper 3H mark scheme

Question	Working	Answer	Mark	AO	Notes
1	7800 ÷ 9.75 or 7800 ÷ 585 × 60			AO2	M2 M1 for 7800 ÷ 9.45 or 7800 ÷ 585 or 13.3....
		800	3		A1
2	28 ÷ (6 − 4) (=14)			AO1	M1 or use of cancelled ratios (eg 3 : 6 : 4 = 0.75 : 1.5 : 1)
	"14" × 3 (=42)				M1 (dep) 28 ÷ 0.5(=56) or cancelled ratios, (e.g. 56 × 0.75) or M2 for 28 ÷ $\frac{2}{3}$ oe
		42			A1
3 a		$25 < d \leq 30$	1	AO3	B1 B1 identifies 25 → 30 class
b	(12 × 2.5) + (6 × 7.5) + (4 × 12.5) + (6 × 17.5) + (14 × 22.5) + (18 × 27.5) **or**			AO3	M2 M1 for frequency × consistent value within interval
	30 + 45 + 50 + 105 + 315 + 495 **or** 1040				NB. Products do not need to be added Condone one error
	'1040' ÷ 60				M1
		$17\frac{1}{3}$	4		A1 accept 17.3(33…)
c				AO3	M1 For $\frac{a}{60}$ with $a < 60$ **or** $\frac{32}{b}$ with $b > 32$
		$\frac{32}{60}$ oe	2		A1

Question	Working	Answer	Mark	AO	Notes	
4	**Working with all 12 boxes** 12×15 (=180) or 12×12 (=144)			AO1	M1	for correct total cost or correct total number of melons (either may appear as part of another calculation)
	$12 \times 12 \times \frac{3}{4} \times 1.6$ oe (=172.8)				M1	for revenue from all full price melons sold
	$12 \times 15 \times 1.15$ oe (=207) **or** 180×0.15 oe (=27)				M1	for total revenue or total profit
	$\frac{'207' - '172.8'}{36}$ **or** $\frac{34.2}{36}$ **or** $\frac{'27' + ('180' - '172.8')}{36}$	0.95	5		M1 A1 cao	dep on M3
	Alternative – working with one box $15 \div 12$ (=1.25) **or** $12 \times \frac{3}{4}$ (=9)				M1	for price of 1 melon **or** number of full price melons
	$12 \times \frac{3}{4} \times 1.6$ oe (=14.4)				M1	for revenue from all full price melons sold
	15×1.15(=17.25)				M1	for total revenue from one box
	$\frac{"17.25" - "14.4"}{3}$ **or** $\frac{2.85}{3}$	0.95	5		M1 A1 cao	dep on M3

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5	Circular arc, centre B, to intersect both lines AB and BC Equal length arcs, from intersections on each line, meeting to give a point on the bisector	correct bisector	2	AO2	M1 A1	dep on M1. Full construction shown.
6 a		$9e^2f(2e + 5f^3)$	2	AO1	M1 A1	Any correct partially factorised expression
b	$(x \pm 6)(x \pm 2)$ $(x - 6)(x + 2)$	6, −2	3	AO1	M1 M1 A1	or correct substitution into quadratic formula (condone one sign error) or $\frac{4 \pm \sqrt{64}}{2}$ dep. on at least M1
7	$\cos 35 = \frac{PR}{17.6}$ $17.6 \times \cos 35$	14.4	3	AO2	M1 M1 A1	 14.4 ~ 14.42
8	22.50 ÷ 15 (=1.5) **or** 100 ÷ 15 (=6.6….) '1.5' × 100 (=150) **or** '6.6…' × 22.5(0)	150	3	AO1	M1 M1 A1	 dep 	M2 for 22.5 ÷ 0.15

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9	**a**		140 000	1	AO1	B1
	b		Mars	1	AO1	B1
	c	$1.2 \times 10^5 - 5 \times 10^4$ **or**			AO1	M1
		120 000 – 50 000 **or** 70 000 oe				
			7×10^4	2		A1
	d	$3.5 \times 10^3 : 1.4 \times 10^6$			AO1	M1
			1 : 400	2		A1
10		$\sqrt{9.5^2 - 7.6^2}$ **or** $\sqrt{90.25 - 57.76}$ **or** $\sqrt{32.49}$ **or** $\sqrt{32.5}$			AO2	M1
		(*BC* =) 5.7				A1
		$\frac{1}{2} \times 7.6 \times$ '5.7' **or** 21.6(6) **or** 21.7				M1 dep on first M1
						or eg. $ACB = \sin^{-1}\left(\frac{7.6}{9.5}\right)$(=53.1...) **and** $\frac{1}{2} \times 9.5 \times$ '5.7' $\times \sin$'53.1'
		$\frac{1}{2} \times \pi \times \left(\frac{\text{'5.7'}}{2}\right)^2$ **or** 12.7(587...) **or** 12.8				M1 dep on first M1
			34.4	5		A1 for answer rounding to 34.4 ($\pi \rightarrow$ 34.4187... 3.14$\rightarrow$34.4123...)

Question	Working	Answer	Mark	AO	Notes
11	e.g. $(x^2 + 5x – 3x – 15)(x + 3)$ **or** $(x^2 + 2x – 15)(x + 3)$ **or** $(x – 5)(x^2 + 3x – 3x – 9)$ **or** $(x – 5)(x^2 – 9)$			AO1	M1 expansion of any two of the three brackets – at least 3 correct terms
	E.g. $x^3 + 3x^2 + 2x^2 + 6x – 15x – 45$ **or** $x^3 + 5x^2 – 9x − 45$				M1 (dep) ft for at least 3 correct terms in second expansion
		$x^3 + 5x^2 – 9x − 45$	3		A1
12 a	14 16 17 18 20 21 22 23 23 24 24 (14 16 17 18 20 <u>21</u> 22 23 23 24 24) (14 16 <u>17</u> 18 20) and (22 23 <u>23</u> 24 24) 23 − 17			AO3	M1 arrange in order **or** One of 21(median), 17(LQ), 23(UQ) identified M1 Identify any **two** of 21, 17 and 23
		6	3		A1 cao
b		Carmelo **and** reason using IQR	1	AO3	B1 ft from (a) Carmelo - he has a lower IQR oe (IQR must be part of the statement)

Question	Working	Answer	Mark	AO	Notes
13 **a**	$m = \frac{5-2}{-3-1}$ **or** $-\frac{3}{4}$ oe			AO1	M1 for gradient
	eg. $2 = -\frac{3}{4} \times 1 + c$ **or**				M1 for method to find c
	$y - 2 = -\frac{3}{4}(x-1)$				
	$y = -\frac{3}{4}x + \frac{11}{4}$				M1 found values of m and c substituted in $y = mx + c$
		$3x + 4y = 11$	4		A1
b	$y = \frac{1-2x}{6}$ **or** $m = -\frac{1}{3}$ oe			AO1	M1
		shown	2		A1 for conclusion from correct gradients
14	$26 \div 20$ (=1.3) **or** 3.6×10 or 3.3×10 or 1×30 **or**			AO3	M1 Any one frequency density (without contradiction) or, e.g. $1\text{cm}^2 = 5$ **or** clear association of area with frequency
	36 **or** 33 **or** 30 **or** $\frac{26}{130}\left(=\frac{1}{5}\right)$				
	$26 + 3.6 \times 10 + 3.3 \times 10 + 1 \times 30$ **or**				M1 Any fully correct complete method; condone one error in bar width or bar height
	$26 + 36 + 33 + 30$ **or** $625 \times \frac{1}{5}$ **or**				
	$(130 + 180 + 165 + 150) \times \frac{1}{5}$				
		125	3		A1

Question		Working	Answer	Mark	AO	Notes	
15	**a**	$(3x + 2)(2x + 1) = 100$			AO1, AO2	M1	or $(2x \times 3x) + 2(2x + 1) + 3x = 100$ oe or $(2x \times 3x) + (2 \times 2x\ (\times 1)) + 1) + 3x + 1 + 1 = 100$ oe other partitions are acceptable but partitioning must go on to form a correct equation.
			$6x^2 + 7x - 98 = 0$ *	2		A1	Accept $6x^2 + 7x + 2 = 100$ if M1 awarded * Answer given
	b	$(3x + 14)(2x - 7)\ (= 0)$			AO1	M2	or $(x =)\dfrac{-7 \pm \sqrt{49 + 2352}}{12}$ or $(x =)\dfrac{-7 \pm \sqrt{2401}}{12}$ If not M2 then M1 for $(3x \pm 14)(2x \pm 7)$ or $(x =)\dfrac{-7 \pm \sqrt{7^2 - 4 \times 6 \times -98}}{2 \times 6}$
		$x = 3.5$				A1	Dependent on at least M1 Ignore negative root
		(Area =) $6 \times$ '3.5'^{2} or $(3 \times$ '3.5') $\times (2 \times$ '3.5')				M1 ft	Dependent on at least M1 and $x > 0$
			73.5	5		A1	

Question	Working	Answer	Mark	AO	Notes	
16	180 − 77 − 39 **or** $\angle BAD = 77°$ **and** $\angle ABD = 39°$ **or** $\angle BA''X'' = 64°$ where X is on PA produced **or** a fully correct method to find angle ADB	64	5	AO2	M2 B1 B1 A1	Also accept 103−39 M1 for $\angle BAD = 77°$ **or** $\angle ABD = 39°$ (angles may be stated or marked on diagram) Opposite angles in a cyclic quadrilateral add up to 180° Alternate segment theorem oe cao
17	41.5 **or** 42.5 **or** 24.5 **or** 23.5 **or** 14.5 **or** 13.5 $(y =)\frac{2\times 41.5}{24.5-13.5}$	7.5	3	AO1	B1 M1 A1	 A1 accept $\frac{83}{11}$ or 7.55 or $7.5\dot{4}$ (depending on M1) NB. Answer **must** come from correct working

Question	Working	Answer	Mark	AO	Notes
18	$(x-1)\times\frac{(3x+2)}{(x^2-1)}$ $(x+1)(x-1)$ eg $\frac{3(x+1)-(3x+2)}{(x+1)}$	$\frac{1}{x+1}$	4	AO1	M1 correct method for divsion M1 correct factorisation of $x^2 - 1$ M1 correct single fraction A1
19	$130 = \pi \times 4.5 \times l$ $l = \frac{130}{4.5\pi}$ or $l = 9.1956$ $\sin(AVO) = \frac{4.5}{"9.2"}$ (= 0.489..)	58.6	4	AO2	M1 M1 For exact expression or answer which rounds to 9.2 M1 For a correct expression for sin AVO or cos AVB cos (AVB) = ("9.2"^{2} + "9.2"^{2} – 9^2)/(2 × "9.2" × "9.2") (=0.521...) A1 awrt 58.6
20 ai		(0, 5)	1	AO1	B1
aii		(3, 10)	1		B1
aiii		(1, 5)	1		B1
b		translation $\begin{pmatrix}0\\-4\end{pmatrix}$	1	AO1	B1

Question	Working	Answer	Mark	AO	Notes
21	$\left(\frac{dy}{dx}\right) = 2 \times 8x - 2x^{-2}$ $2 \times 8x - 2x^{-2} = 0$ $x = \frac{1}{8}$ or $x = 0.5$ oe	(0.5, 6)	5	AO1	M2 (M1 for one term differentiated correctly) M1 dep on M1 M1 A1
22	$\overrightarrow{AE} = \overrightarrow{AD} + \overrightarrow{DE}$ oe eg. $\overrightarrow{DE} = \frac{1}{3}\overrightarrow{DB}$ or $\overrightarrow{BE} = \frac{2}{3}\overrightarrow{BD}$ $\overrightarrow{AE} = 2\mathbf{b} + 4\mathbf{a}$ $\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AD} + \overrightarrow{DC}$ (=3**b** + 6**a**) eg. $\overrightarrow{AE} = 2(\mathbf{b} + 2\mathbf{a})$ **and** $\overrightarrow{BC} = 3(\mathbf{b} + 2\mathbf{a})$		5	AO2	M1 may be fully or partially in terms of **a** and/or **b** M1 correct use of ratio A1 M1 may be fully or partially in terms of **a** and/or **b** A1 **NB** Correct expressions for *BC* and *AE* must be given

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23	$a + 3d = 17$ or $a + 9d = 35$ or $35 - 17 = 6d$			AO1	M1 A1		M1 for $17 = 4p + q$ **and** $35 = 10p + q$ $p = 3$ and $q = 5$
	$d = 3$				A1	ft from $d = 3$	$u_1 = 8$ and $u_{50} = 155$
	$a = 8$				M1		$\frac{1}{2} \times 50(8 + 155)$
	$\frac{50}{2}$ (2 × '8' + (50 − 1) '3') oe	4075	5		A1		