International GCSE in Mathematics A - Paper 2H mark scheme
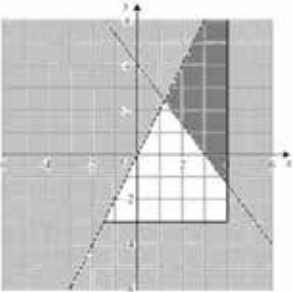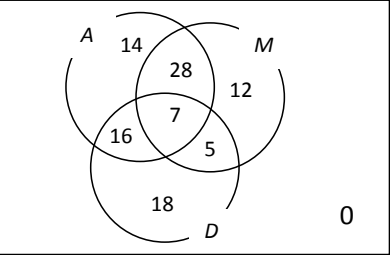
Question	Working	Answer	Mark	AO		Notes
1	$2 \times 2 \times 5$ **or** $2 \times 3 \times 5$ **or** $3 \times 3 \times 5$ **or** two of 20, 40, 60 … 30, 60, 90 … 45, 90, 105 $2 \times 2 \times 5$ **and** $2 \times 3 \times 5$ **and** $3 \times 3 \times 5$ **or** all of 20, 40, 60 , 80 … 180 30, 60, 90 … 180 45, 90, 105 … 180			AO1	M1	for one of 20, 30, 45 written as product of prime factors **or** list of at least 3 multiples of any two of 20, 30, 45
					M1	
		180	3		A1	for 180 or $2 \times 2 \times 3 \times 3 \times 5$ oe
2				AO1	M1	for $7n + k$ (k may be zero)
		$7n - 5$ oe	2		A1	
3	$\frac{1}{2} \times (10 + 14) \times 9$ oe ($= 108$)			AO2	M1	for area of cross section
	'108' $\times$ 6 (=648)				M1	(dep on previous M1) for volume of prism
	'648' $\times$ 0.7				M1	(independent)
		453.6	4		A1	accept 454

Question		Working	Answer	Mark	AO		Notes
4	**a**		p^9	1	AO1	B1	
	b		m^{-12}	1	AO1	B1	
	c		1	1	AO1	B1	
	d		$2^{\frac{1}{3}}$	1	AO1	B1	
	e	$5x + 35 = 2x - 10$ **or** $x + 7 = \dfrac{2x}{5} - \dfrac{10}{5}$			AO1	M1	for removing bracket or dividing all terms by 5
		eg. $5x - 2x = -10 - 35$ **or** $7 + \dfrac{10}{5} = \dfrac{2x}{5} + x$				M1	for isolating x terms in a correct equation
			-15	3		A1	dep on M1
5		14000×4 (=56000)			AO1	M1	NB. multiplication by 4 may occur before or after percentage decrease
		$0.075 \times$ '56000' (=4200) **or** 0.075×14000 (=1050)				M1	
		'56000' – '42000' **or** $14000 - $ '1050'				M1	(dep)
			51 800	4		A1	

Question		Working	Answer	Mark	AO		Notes
6	**a**		triangle with vertices (3, -1) (3, -4) (5, -4)	1	AO2	B1	
	b		Rotation		AO2	B1	
			centre (-3, 0)			B1	
			90º anticlockwise	3		B1	accept $+90^0$, 270º clockwise, $-270º$
							NB. If more than one transformation then no marks can be awarded
7	**a**	$4 \times 15\ (=60)$ **or** $\dfrac{a+b+c+d}{4}=15$ **or** $4 \times 15 - 39$			AO3	M1	
			21	2		A1	
	b	$d - a = 10$ **or** $a = 11$ **or** $a = $ "21" $- 10$ **or** $b + c = 39 - 11 = 28$			AO3	M1	ft from (a) (can be implied by 11, b, c, 21 **OR** a, b, c, d with $b + c = 28$)
			14	2		A1 cao	
8		$0.02 \times 40\,000\ (=800)$ **or** $1.02 \times 40\,000\ (=40800)$ **or** 2400			AO1	M1	
		"40800"×0.02(=816) **and** "41616"×0.02(=832.32) **OR** 2448.32				M1	(dep) method to find interest for year 2 **and** year 3
			42448.32	3		A1	

Question	Working	Answer	Mark	AO		Notes
9	$3x + y = 13$ **or** $6x + 2y = 26$ $-\ 3x - 6y = 27$ $\quad +\ x - 2y = 9$ eg. $3x - 2 = 13$ **or** $15 + y = 13$			AO1	M1 M1 A1	multiplication of one equation with correct operation selected **or** rearrangement of one equation with substitution into second (dep) correct method to find second variable for both solutions dependent on correct working
		5,−2	3			
10	$\dfrac{14}{3} \div \dfrac{32}{9}$ $\dfrac{14}{3} \times \dfrac{9}{32}$ **or** $\dfrac{126}{27} \div \dfrac{96}{27}$ **or** $\dfrac{42}{9} \div \dfrac{32}{9}$			AO1	M1 M1 A1	 correct answer from correct working
		answer given	3			
11	$(6 - 2) \times 180\ (=720)$ '720' − (86 + 123 + 140 + 105) (=266) **or** '720' − 454 (=266) '266' ÷ 2			AO2	M1 M1 M1 A1	complete method to find sum of interior angles dep on 1st method mark dep on 1st method mark
		133	4			

Question		Working	Answer	Mark	AO		Notes
12	**a**		8, 25, 50, 90, 112, 120	1	AO3	B1	cao
	b	Plotting points from table at ends of interval			AO3	M1	$\pm$ ½ sq ft from sensible table
							ie clear attempt to add frequencies
		Points joined with curve or line segments		2		A1	ft from points if 4 or 5 correct or if all points are plotted consistently within each interval at the correct heights
							Accept cf graph which is not joined to the origin
							NB A bar chart, unless it has a curve going consistently through a point in each bar, scores no points.
	c	60 (or 60.5) indicated on cf graph			AO3	M1	for 60 (or 60.5) indicated on
		or stated					cf axis or stated
			approx 33	2		A1	If M1 scored, ft from cf graph
							If no indication of method, ft only from correct curve & if answer is correct ($\pm$ ½ sq tolerance) award M1 A1
13		$P - c = \dfrac{1}{2}ab^2$			AO1	M1	Isolate term in b
		$\dfrac{2(P-c)}{a} = b^2$				M1	Isolate b^2
			$b = \sqrt{\dfrac{2(P-c)}{a}}$	3		A1	oe with b as the subject

Question		Working	Answer	Mark	AO		Notes
14	a	2 correct points plotted eg (0, 4) and (3, 0) $4x + 3y = 12$ drawn		2	AO1	M1 A1	
	b	 Correct region		3	AO1	B3	Correct region B2 for $x = 4$ and $y = -3$ drawn **and** consistent shading correct for at least two inequalities B1 for $x = 4$ and $y = -3$ drawn
15	a			3	AO1	B3	Correct diagram B2 for 3 over-lapping circles with 7 in intersection **and** at least 2 other correct numbers B1 for 3 over-lapping circles with 7 in intersection
	b		$\dfrac{34}{100}$ oe	1	AO3	B1	ft from diagram
	c		$\dfrac{23}{46}$ oe	1	AO3	B1	ft from diagram

Question		Working	Answer	Mark	AO		Notes
16	**a**	$M = \dfrac{k}{g^3}$ **or** $M \propto \dfrac{k}{g^3}$			AO1	M1	
		$24 = \dfrac{k}{2.5^3}$ oe **or** $(k = 375)$				M1	implies first M1
			$M = \dfrac{375}{g^3}$	3		A1	accept $M = \dfrac{k}{g^3}$ with $k = 375$ stated elsewhere in question
	b	$(g =)\sqrt[3]{375 \div \left(\dfrac{1}{9}\right)}$ oe **or** $\sqrt[3]{3375}$			AO1	M1	
			15	2		A1	
17	**a**		−3	1	AO1	B1	
	b		2	1	AO1	B1	
	c	g(2) = 6			AO1	M1	
			0.75 oe	2		A1	
18		correct length scale factor			AO2	M1	
		eg $\sqrt{\dfrac{384}{864}}$ **or** $\dfrac{2}{3}$ **or** $\dfrac{3}{2}$					
		$\left(\dfrac{2}{3}\right)^3 \times 2457$				M1	for complete method
			728	3		A1	

Question		Working	Answer	Mark	AO		Notes
19			E, B, D, A	3	AO1	B3	All correct
							B2 for 3 correct
							B1 for 2 correct
20	**a**	$\dfrac{4}{9} \times \dfrac{3}{8}$			AO3	M1	
			$\dfrac{1}{6}$	2		A1	oe , eg $\frac{12}{72}$
							Allow 0.16(666...) rounded or truncated to at least 2dp
	b	$\dfrac{5}{9} \times \dfrac{4}{8} + \dfrac{4}{9} \times \dfrac{5}{8}$ or $\dfrac{20}{72} + \dfrac{20}{72}$ oe	$\dfrac{5}{9}$		AO3	M2	M1 for $\dfrac{4}{9} \times \dfrac{5}{8}$ or $\dfrac{5}{9} \times \dfrac{4}{8}$ or $\dfrac{20}{72}$ oe
		or $1 - \dfrac{4}{9} \times \dfrac{3}{8} - \dfrac{5}{9} \times \dfrac{4}{8}$ or $1 - \dfrac{'1'}{6} - \dfrac{5}{9} \times \dfrac{4}{8}$					Accept fractions evaluated
		oe					$\dfrac{20}{72} = 0.27\dot{7}$, $\dfrac{12}{72} = 0.16\dot{6}$
							rounded or truncated to at least 2dp
				3		A1	oe, e.g. $\dfrac{40}{72}$ or $\dfrac{20}{36}$

Question		Working	Answer	Mark	AO		Notes
21		$\dfrac{\sin 47}{13.8} = \dfrac{\sin MLN}{8.5}$			AO2	M1	Or method using a right angled triangle to find length MX (MX is perpendicular to LN) $\sin 47 = \dfrac{MX}{8.5}$
		$MLN = \sin^{-1}\left(\dfrac{\sin 47 \times 8.5}{13.8}\right)$				M1	Or $\cos^{-1} = \dfrac{8.5\sin 47}{13.8}$
		$MLN = 26.7(73...)$				A1	$LMX = 63.232$
		$LMN = 180 - 47 - \text{'}26.7...\text{'}$ or $106(.2260622...)$				M1	$LMN = 63.232 + (180 - (90+47))\ldots$ or $106(.2260622\ldots)$
		$\dfrac{1}{2} \times 8.5 \times 13.8 \times \sin("106")$				M1	
			56.3	6		A1	Accept an answer that rounds to 56.3 or 56.4 unless clearly obtained from incorrect working.
22	**a**	$2(x^2 - 4x) + 9$ **or** $2(x^2 - 4x + \dfrac{9}{2})$			AO1	M1	
		$2((x-2)^2 - 2^2) + 9$ **or** $2((x-2)^2 - 2^2 + \dfrac{9}{2})$				M1	
			$2(x-2)^2 + 1$	3		A1	
	b		explanation	1	AO1	B1	E.g. Because minimum is at (2, 1)

Question	Working	Answer	Mark	AO		Notes
23	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC}$ **or** $\begin{pmatrix} -2 \\ -3 \end{pmatrix} + \begin{pmatrix} 9 \\ 4 \end{pmatrix}$ **or** $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$ $\sqrt{'7'^2 + '1'^2}$	$\sqrt{50}$ oe	3	AO2	M1 M1 A1	dep accept 7.07(06…)
24	$\dfrac{\left(\sqrt{12} - 1\right)\left(2 + \sqrt{3}\right)}{\left(2 - \sqrt{3}\right)\left(2 + \sqrt{3}\right)}$ $\dfrac{2\sqrt{12} - 2 + \sqrt{12}\sqrt{3} - \sqrt{3}}{4 - 3}$ $\sqrt{12} = 2\sqrt{3}$	shown	4	AO1	M1 M1 B1 A1	method to rationalise correct expansion of brackets may be seen before expansion answer from fully correct working with all steps seen
25	$(v =) \; 3t^2 - 5 \times 2t - 8$ $3t^2 - 10t - 8 = 0$ $(3t + 2)(t - 4) = 0$	4	4	AO1	M1 A1 M1 A1	for 2 out of 3 terms differentiated correctly correct equation for method to solve quadratic $t = 4$ only