International GCSE in Mathematics B - Paper 2 mark scheme

Question	Working	Answer	Mark	AO	Sub-total	Total
1	$\frac{65}{100}\times 80\times 100$ (=£5200) + $\frac{55}{100}\times 80\times 50$ (=£2200)		M1	1.1		
	$\frac{45}{100}\times 80\times(280-'150')$ (= £4680)		M1 DEP			
	'£5200' + '£2200' + '£4680' £12 080.00		M1 DEP			
		£12 080.00	A1			**4**
2(a)	$(2x-5y)(2x+5y)$ (at least one correct)		M1	1.3		
		$(2x-5y)(2x+5y)$	A1		2	
2(b)	$\frac{x^2-11x+24}{x+5}\times\frac{2x^2+7x-15}{x-3}$		M1	1.3		
	Attempt at factorising a quadratic **NB:** For method, the two bracketed terms, when multiplied out, must give at least two of the three terms from the trinomial quadratic equation		M1			
		$(x-8)(x-3)$	A1			
		$(2x-3)(x+5)$	A1			
		$(x-8)(2x-3)$	A1		5	**7**

Question	Working	Answer	Mark	AO	Sub-total	Total
3(a)		10, 45 and 8	B1	1.2		
		$25 - x$, $13 - x$	B1	1.2	2	
3(b)		c's six terms = 90	B1 ft	1.2	1	
3(c)		11 (cao and correctly obtained)	B1	1.3	1	
3(d)(i)		35 (cao)	B1	1.2		
3(d)(ii)	$66 - '11'$ or $90 - '35'$	55	B1 ft	1.2	2	**6**
4(a)	$\frac{dy}{dx} = -1 - 4x = 0$ (1 term correct in a linear exp in x)		M1	1.4		
	Substitute 'x' in y.	$\therefore x = -\frac{1}{4}$	A1			
			M1			
		$\therefore y = 6\frac{1}{8}$	A1		4	
4(b)(i)		$\frac{dy}{dx}(x = -1) = +3$, and $\frac{dy}{dx}(x = 0) = -1$	B1			

Question	Working	Answer	Mark	AO	Sub-total	Total
4(b)(ii)	Since gradrients are +3, 0 and –1 at $x = -1,\ -\frac{1}{4}$ and 0 respectively, $\therefore \left(-\frac{1}{4},\ 6\frac{1}{8}\right)$ is a maximum (cc)	(cc)	B1		2	**6**
5	$x^2 + (x+1)^2 = 5$ (substitute $y = x + 1$) $(x+2)(x-1) = 0$ (solving trinomial quadratic) Substituting $x =\ 2$ and $x\ \ 1$ in $y = x + 1$ for the value of y) (or $(y-1)^2 + y^2 = 5$ (subst. $y = x + 1$) $(y-2)(y+1) = 0$ (solving trinomial quadratic) Substituting $y = 2$ and $y = -1$ in $y = x + 1$ for the value of x))	$x^2 + x - 2 = 0$ $x =\ 2$ and $x\ \ 1$ ($y^2 - y - 2 = 0$) ($y = 2$ and $y = -1$) $x = -2, y = -1$ and $x = 1, y = 2$ (cc)	M1 A1 M1 INDEP A1 M1 DEP (M1) (A1) (M1) (A1) (M1 DEP) A1	1.3	6	**6**

Question	Working	Answer	Mark	AO	Sub-total	Total
6(a)	**N.B.** Second **B1 ft** is for a correct horizontal line, of correct length, drawn from the end of the first line segment. Third **B1 ft** is for their line, starting where their horizontal line finishes and terminates at Northampton at 11 : 45	each correct section of journey	B1,B1 ft, B1 ft	1.4	3	
6(b)	11 : 45 – ‘10:09’ (96 minutes) **NB:** For method, the mark is awarded from 11 : 45 minus the start time from Bradford		M1			
		70 km/h	A1		2	
6(c)		one straight line, correct starting point	B1			
	NB: For **ft**, must finish at Manchester, 2 hours after leaving Northampton.	correct finishing point	B1 ft		2	
6(d)(i)		10.33 (±2 min)	B1 ft			
6(d)(ii)		28 km (±1 km)	B1 ft		2	**9**

Question	Working	Answer	Mark	AO	Sub-total	Total
7(a)	**Penalise not rounded correctly ONCE only in question**					
	$AC^2 = 12^2 + 9^2 - 2\times12\times9\times\cos100$		M1	2.9		
	$AC^2 = 225 + 37.5$ …		M1 DEP			
		16.2m (16.2020…)	A1		3	
7(b)	$\dfrac{9}{\sin\angle CAB} = \dfrac{'16.2'}{\sin100}$		M1			
	$\sin\angle CAB = \dfrac{9\times\sin100}{"16.2"}$		M1 DEP			
	$(\text{or } 9^2 = 12^2 + "16.2"^2 - 2\times12\times"16.2"\times\cos\angle CAB$		(M1)	2.9		
	$\cos\angle CAB = \dfrac{12^2 + "16.2"^2 - 9^2}{2\times12\times"16.2"})$		(M1 DEP)			
		$\angle CAB = 33.2^\circ$ (33.164492…)	A1		3	
7(c)	$\sin"33.16" = \dfrac{BD}{12}\quad (BD = 6.565)$		M1	2.9		
	$\Delta ABD = \dfrac{1}{2}\times12\times"6.565"\times\sin(180-(90+"33.16"))$		M1 DEP	2.7		
	$(\text{or } \cos"33.16..." = \dfrac{AD}{12}\ (AD = 10.04524)$		(M1)	(2.9)		
	$\Delta ABD = \dfrac{1}{2}\times12\times"10.04524"\times\sin("33.164492"))$		(M1 DEP)	(2.7)		
		$\Delta ABD = 32.97 \rightarrow$ 33 m^2	A1	2.7	3	**9**

Question	Working	Answer	Mark	AO	Sub-total	Total
8(a)		1.25, 3.75. 2.25 [–2.75, 0.25, 1.25] (oe)	B1, B1, B1	1.4	3	
8(b)	Curve –1 mark for straight line segments each point missed each missed segment each point not plotted each point incorrectly plotted tramlines very poor curve **N.B.** Accuracy for both plotting and drawing is $\pm\frac{1}{2}ss$		B3 ft (–1 eeoo)		3	
8(c)	**N.B.** Accept (1.15, –2.18) B1 ft and (4.35, –0.57) B1 ft **SC:** 1.15 < x < 4.35 scores B1 B0	x = 1.15 (± 0.05) (from 'graph') x = 4.35 (± 0.05) (from 'graph')	B1 ft B1 ft		2	
8(d)	Reading off y values at x = '1.15' and '4.35' or choosing two points on AB and reading off the corresponding Δx and Δy gradient = $\frac{\Delta y}{\Delta x} = \frac{'(-2.18)'-'(-0.57)'}{'4.35'-'1.15'}$ ($\pm\frac{1}{2}ss$ for each coordinate element)	gradient = –0.5 (+/–0.05 allowing $\pm\frac{1}{2}ss$) (cao)	M1 M1 DEP A1		3	**11**

Question	Working	Answer	Mark	AO	Sub-total	Total
9(a)		$1 - p$	B1	3.10	1	
9(b)		for each correct pair	B1 ft, B1, B1		3	
9(c)	P(pass) = 5 × (1 – P(pass))		M1			
	P(pass) = $\frac{5}{6}$		A1			
	awrt 0.838					
	$\text{P(pass)}='\frac{5}{6}' = \text{one of } \quad p\times'0.8' \quad \text{or} \quad (1-p)\times'0.9'$		M1			
	$\text{P(pass)}='\frac{5}{6}' = p\times'0.8'+(1-p)\times'0.9'$		M1 DEP			
		$p = \frac{2}{3}$, 0.667	A1		5	
9(d)			M1			
	any probability ÷ (‘5/6’)		M1 DEP			
	$\dfrac{\left('2/3'\times'0.8'\right)}{\left('5/6'\right)}$	$\frac{48}{75}$ (oe), 0.64	A1		3	**12**

Question	Working	Answer	Mark	AO	Sub-total	Total
10(a)	**Penalise labelling ONCE only** Triangle *A*	triangle *A* drawn	B1	1.4	1	
10(b)		$y = -1$ drawn	B1	1.4	1	
10(c)		triangle *B* drawn	B1	2.8	1	
10(d)	At least two construction lines through (0, –2)		M1	2.8		
		triangle *C* drawn	A2 ft (–1 ee)	1.5	3	
10(e)	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$"$\begin{pmatrix} -1 & -2 & -3 \\ 1 & -1 & -1 \end{pmatrix}$"		M1	1.5		
		$\begin{pmatrix} 1 & 2 & 3 \\ 1 & -1 & -1 \end{pmatrix}$	A1 ft			
		triangle *D* drawn	A1		3	
10(f)		reflection $x = 0$ or y-axis	B1 B1	1.5	2	
10(g)	More than one transformation scores B0, B0, B0	enlargement scale factor 2 centre (0, –4)	B1 B1 B1	2.8	3	**14**

Question	Working	Answer	Mark	AO	Sub-total	Total
11(a)(i)		$\mathbf{a} + 2\mathbf{b}$	B1	2.8		
11(a)(ii)	$\overrightarrow{CB}$ = - (‘$\mathbf{a} + 2\mathbf{b}$’) + $4\mathbf{b}$		M1	2.8		
	$\overrightarrow{CG} = \frac{3}{5}$ ‘$(2\mathbf{b} - \mathbf{a})$’		M1	2.8		
		$\frac{3}{5}(2\mathbf{b} - \mathbf{a})$	A1	2.8	4	
11(b)(i)	$\overrightarrow{FG} = \frac{3}{5}$ ‘$(\mathbf{a} + 2\mathbf{b})$’ + ‘$\frac{3}{5}(2\mathbf{b} - \mathbf{a})$’		M1	2.8		
		$\overrightarrow{FG} = \frac{12}{5}\mathbf{b}$	A1	1.3		
11(b)(ii)		$\lambda = \frac{12}{5}$	B1 ft	2.8	3	
11(c)(i)	From given ratios and (b), $\Delta s \frac{FCG}{OCB}$ are similar $\because$ $\frac{FC}{OC} = \frac{CG}{CB}$ $\frac{FG}{OB}$ $\frac{3}{5}$ or give reasons for AAA or give reasons for SAS		M1	2.6		
		(cc)	A1	2.6		
11(c)(ii)	As $\Delta s \frac{FCG}{OCB}$ are similar , $\therefore \lvert\Delta OCB\rvert : \lvert\Delta FCG\rvert = 5^2 : 3^2$		M1	2.6		

Question	Working	Answer	Mark	AO	Sub-total	Total
11(c)(ii) (cont'd)	**or** $\frac{\text{area } \Delta OCB}{\text{area } \Delta FCG} = \frac{\frac{1}{2} \times CO \times CB \times \sin C}{\frac{1}{2} \times CF \times CG \times \sin C}$ $= \frac{\frac{1}{2} \times CO \times CB \times \sin C}{\frac{1}{2} \times \frac{3}{5}CO \times \frac{3}{5}CB \times \sin C} = \frac{25}{9}$		(M1)	(2.7)		
		25 : 9	A1	2.7	4	
11(d)(i)	$\lvert\Delta OCB\rvert = \frac{25}{9} \times \lvert\Delta FCG\rvert = \frac{25}{9} \times 18 \text{ } (=50)$	$\lvert\Delta OCB\rvert = 50$	M1	1.1		
			A1	1.1		
11(d)(ii)	$\lvert\Delta ACO\rvert = \frac{1}{2}\lvert\Delta OCB\rvert \quad (= "25")$		M1	2.7		
	$\left(\because \angle ACO = \angle COB \text{ and } \lvert AC\rvert = \frac{1}{2}\lvert OB\rvert\right)$ $\therefore \lvert OACB\rvert = \lvert\Delta ACO\rvert + \lvert\Delta OCB\rvert = "25" + "50"$		M1 DEP	2.7		
		75 (cm^2) (cao)	A1	2.7	5	**16**