

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0444 MATHEMATICS (US)

0444/41

Paper 4, maximum raw mark 130

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answers	Mark	Part Marks
1	(a) (i) $\frac{13}{13+8+3} \times 12000$ with no subsequent errors	1	
	(ii) 4000	1	
	(b) $2 \times 6500 + 5 \times \text{their(a)(ii)} + (12000 - 6500 - \text{their(a)(ii)})$ or $(13 \times 2 + 8 \times 5 + 3 \times 1) \times 500$	2	B1 for any two of 2×6500 , $5 \times \text{their(a)(ii)}$, $(12000 - 6500 - \text{their(a)(ii)})$ seen or $13 \times 2 + 8 \times 5 + 3 \times 1$
	(c) 37500	3	M2 for $\frac{34500}{100-8} \times 100$ oe or M1 for 34500 associated with (100 – 8)%
(d) $\frac{11}{26}$ cao	2	M1 for any correct simplified version of $\frac{2750}{6500}$	
2	(a) 1.5 1.25 –0.75 0.5	4	B1 for each
	(b) Fully correct curve	5	B5 for correct curve over full domain or B3 FT for 11 or 12 points or B2 FT for 9 or 10 points or B1 FT for 7 or 8 points and B1 independent for one complete branch on each side of the y -axis and not touching or crossing the y -axis. SC4 for correct curve with branches joined

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	(c)	-1.35 to -1.25	1		
		-0.27 to -0.251	1		
		1.51 to 1.55	1		
	(d)	$k < 1.2$ or 1.15 to 1.25	2		SC1 for 1.15 to 1.25 seen or horizontal line drawn at min point
	(e)	tangent ruled at $x = -1$	B1		No daylight at $x = -1$ Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.1$ and -0.9
		- 1.7 to - 1.3	2	dep on B1 or a close attempt at tangent at $x = -1$ or M1 for rise/run also dep on any tangent drawn or close attempt at tangent at any point. Must see correct or implied calculation from a drawn tangent	
3	(a)	(i)	image at (1, -3), (4, -3), (2, -2), (1, -2)	2	SC1 for translation $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -4 \end{pmatrix}$ or 4 correct vertices plotted but not joined
		(ii)	image at (-6, 1), (-9, 1), (-7, 2), (-6, 2)	2	SC1 for reflection in other vertical line or in $y = -2$ or 4 correct vertices plotted but not joined
		(iii)	image at (-6, -1), (-9, -1), (-7, -2), (-6, -2)	2	SC1 for any other 180° rotation or 4 correct vertices plotted but not joined
	(b)	(i)	enlargement	1	accept dilation
			[centre] (1, 0)	1	not as column vector
			[scale factor] - 3	1	
		(ii)	stretch	1	
			[factor] 3	1	
		x -axis invariant	1	accept 'the line $y = 0$ ' for x -axis	

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4	(a) (i)	$\frac{3}{8}$ oe	1	0.375
	(ii)	$\frac{7}{8}$ oe	1	0.875
	(b) (i)	$\frac{6}{8}, \frac{5}{9}, \frac{4}{9}, \frac{5}{9}$ oe in correct places	2	B1 for 2 correct
	(ii)	$\frac{34}{72}$ oe	3	M2 FT for $\frac{2}{8} \times \textit{their} \frac{5}{9} + \textit{their} \frac{6}{8} \times \textit{their} \frac{4}{9}$ oe or M1 FT for one of these products in the answer space
(c)	$\frac{48}{72}$ oe	2	M1 for $\frac{6}{8} \times \frac{8}{9}$ oe	
5	(a) (i)	10.6 or 10.59...	2	M1 for $\tan = \frac{55}{294}$ oe
	(ii)	175 or 174.9[...] to 175.[1...]	4	M2 for [adj =] $\frac{55}{\tan 24.8}$ oe or M1 for implicit version and M1 dep on at least M1 for 294 – <i>their</i> adj
	(b) (i)	11.5 or 11.53 to 11.54 168.5 or 168.4 to 168.5	1 1	allow 168 SC for 11.5 or 168.5 seen in working or two angles, one acute and one obtuse, adding to 180
	(ii)	$\sqrt{3}$	1	
	(iii)	[p =] 2	1	
		[q =] 0.5	1	
	(iv)	$\tan(x - 2)$	1	

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6	(a) (i)	$24 < t \leq 30$	1		
		(ii)	30.9 or 30.875 nfw	4	<p>M1 for midpoints soi (condone 1 error or omission) 5, 17, 27, 35, 50, 65 soi</p> <p>M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (50, 1530, 3645, 2975, 3500, 650) and M1 (dep on 2nd M1) for $\sum fx \div 400$</p>
	(b) (i)	[10 100] 235 320 390 [400]	2	<p>B1 for any two correct SC1 for 235, n, $n + 70$ $n > 235$</p>	
		(ii)	Correct curve or polygon	3	<p>B1 for correct horizontal placement B1FT for correct vertical placement</p> <p>B1FT dep on at least B1 for reasonable increasing curve or polygon through their 6 points</p> <p>If zero scored SC1 for 5 out of 6 points correctly plotted</p>
	(c) (i)	27.5 to 29	1		
		(ii)	12 to 14	2	B1 for 36 to 38 or 24 seen
		(iii)	18 to 20	2	B1 for 60 seen or marked on grid
		(iv)	30 to 45	2	B1 for 355 to 370 seen
	7	(a) (i)	8.27 or 8.269... nfw	4	<p>M2 for $7.6^2 + 8.4^2 - 2 \times 7.6 \times 8.4 \times \cos(62)$ oe or M1 for implicit form</p> <p>A1 for $[PQ^2 =]$ 68.3 to 68.5</p>
			(ii)	28.2 or 28.18..	2
(b)		55.8 or 55.78 to 55.79 nfw	5	<p>B1 for $[HGJ] = 81$</p> <p>B1 for $[GHJ] = 61$</p> <p>M2 for $[GJ =] \frac{63}{\sin(\text{their } 81)} \times \sin(\text{their } 61)$ or M1 for implicit form After M0, SC1 for final answer of 68.1...</p>	

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8	(a)	$5x = 75$ or $5x + 48 = 123$	B2	M1 for $x + (x + 12) + 3(x + 12) = 123$ oe
	(b)	15 6, 7	B1 3	M1 for $t < 8$ M1 for $t \geq \frac{37}{7}$ OR SC2 for final answer of 5, 6, 7 or 6, 7, 8 or SC1 for final answer of 5, 6, 7, 8
	(c) (i)	1.8 oe	3	M1 for $21 - x = 4(x + 3)$ or better B1 for $[\pm]5x = k$ or $kx = [\pm]9$
	(ii)	$\sqrt{7^2 - 4 \times 3 \times (-5)}$ or better nfw and $\frac{-7 + \sqrt{q}}{2(3)}$ or $\frac{-7 - \sqrt{q}}{2(3)}$ oe -2.91 and 0.57 final ans cao	B1 B1 B1B1	or for $\left(x + \frac{7}{6}\right)^2$ or for $-\frac{7}{6} \pm \sqrt{\frac{5}{3} + \left(\frac{7}{6}\right)^2}$ SC1 for 0.6 or 0.573... and -2.9 or -2.907 or -2.906... or -0.57 and 2.91 or 0.57 and -2.91 seen in working
9	(a) (i)	5	2	M1 for $25x + 11x = 180$ oe or better
	(ii)	35	2FT	FT $90 - 11 \times \textit{their } x$ only if answer is positive M1 for [angle $AOC =$] $22 \times \textit{their } x$

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(b) (i)	37.7 or 37.69 to 37.704 nfw	2	M1 for $6\pi + 4\pi \pm 2\pi$ oe
(ii)	12100, 12060, 12070, 12062.4 to 12065.6 nfw	5	SC4 for answer with figs 121 or 1206 to 1207 OR M2 for total area = $\frac{1}{2}\pi 6^2 + \frac{1}{2}\pi 4^2 - \frac{1}{2}\pi 2^2$ or $\frac{1}{2}\pi 60^2 + \frac{1}{2}\pi 40^2 - \frac{1}{2}\pi 20^2$ or M1 for $\frac{1}{2}\pi 6^2$ or $\frac{1}{2}\pi 4^2$ or $\frac{1}{2}\pi 2^2$ or $\frac{1}{2}\pi 60^2$ or $\frac{1}{2}\pi 40^2$ or $\frac{1}{2}\pi 20^2$ A1 for area = 75.39 to 75.41 or 7539 to 7541 and M1 dep for volume = <i>their</i> area \times thickness
10 (a) (i)	13.1	1	
(ii)	120	1	
(b) (i)	Correct perpendicular bisector with two pairs of intersecting arcs	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs
(ii)	Accurate angle bisector at <i>A</i> with correct intersecting arcs	2	B1 for accurate with no/wrong arcs or M1 for correct intersecting arcs
(c)	Complete circle drawn with <i>AD</i> as tangent	1	
(d)	Correct angle and <i>Y</i> marked on <i>BC</i> with correct arcs	2	B1 for accurate angle with arcs or <i>Y</i> on <i>BC</i> without correct arcs
11 (a)	$\frac{At}{t+r}$ final answer oe nfw	4	B1 for $t(A-x) = xr$ or $tA - tx = xr$ or $A = \frac{xr}{t} + x$ M1 for correctly completing multiplication by <i>t</i> (eliminating any bracket) and <i>x</i> terms isolated M1 for correct factorisation M1 dep for correct division
(b)	[<i>a</i> =] 64 [<i>b</i> =] -8	3	B1 for $2b = -16$ or $(x-8)^2$ B1 for $a = (\textit{their } b)^2$ If 0 scored, SC1 for $x^2 + 2bx + b^2$ soi

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(c)	$\frac{13x + 8}{(x - 4)(3x - 2)}$ final answer nfw	3	B1 for $6(3x - 2) - 5(x - 4)$ or better seen B1 for $(x - 4)(3x - 2)$ oe seen as denom or SC2 for final answer $\frac{13x - 32}{(x - 4)(3x - 2)}$
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