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)	$2 \times 6500 + 5 \times$ *their* **(a)(ii)** + $(12000 - 6500 -$ *their* **(a)(ii)**$)$ or $(13 \times 2 + 8 \times 5 + 3 \times 1) \times 500$	2	**B1** for any two of 2×6500, $5 \times$ *their* **(a)(ii)**, $(12000 - 6500 -$ *their* **(a)(ii)**$)$ seen or $13 \times 2 + 8 \times 5 + 3 \times 1$
(c)	37 500	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

	(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

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 – *their* adj
	(b) (i)	11.5 or 11.53 to 11.54	1	
		168.5 or 168.4 to 168.5	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	

6	(a) (i)	$24 < t \leqslant 30$	1	
	(ii)	30.9 or 30.875 nfww	4	**M1** for midpoints **soi** (condone 1 error or omission) 5, 17, 27, 35, 50, 65 soi **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 $\sum fx \div 400$
	(b) (i)	[10 100] 235 320 390 [400]	2	**B1** for any two correct **SC1** for 235, n, $n + 70$ $n > 235$
	(ii)	Correct curve or polygon	3	**B1** for correct horizontal placement **B1FT** for correct vertical placement **B1FT dep on at least B1** for reasonable increasing curve or polygon through their 6 points If zero scored **SC1** for 5 out of 6 points correctly plotted
	(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... nfww	4	**M2** for $7.6^2 + 8.4^2 - 2 \times 7.6 \times 8.4 \times \cos(62)$ oe or **M1** for implicit form **A1** for $[PQ^2 =]$ 68.3 to 68.5
	(ii)	28.2 or 28.18..	2	**M1** for $0.5 \times 7.6 \times 8.4 \times \sin 62$ oe
	(b)	55.8 or 55.78 to 55.79 nfww	5	**B1** for $[HGJ] = 81$ **B1** for $[GHJ] = 61$ **M2** for $[GJ =] \dfrac{63}{\sin(their\ 81)} \times \sin(their\ 61)$ or **M1** for implicit form After **M0, SC1** for final answer of 68.1…

8	**(a)**	$5x = 75$ or $5x + 48 = 123$	**B2**	**M1** for $x + (x + 12) + 3(x + 12) = 1$…
		15	**B1**	
	(b)	6, 7	**3**	**B2** for answer of 6 or 7 OR **M1** for $t < 8$ **M1** for $t \geqslant \frac{37}{7}$ 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 nfww	**B1**	or for $\left(x + \frac{7}{6}\right)^2$
		and		
		$\frac{-7 + \sqrt{q}}{2(3)}$ or $\frac{-7 - \sqrt{q}}{2(3)}$ oe	**B1**	or for $-\frac{7}{6} \pm \sqrt{\frac{5}{3} + \left(\frac{7}{6}\right)^2}$
		– 2.91 and 0.57 final ans cao	**B1B1**	**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** $90 - 11 \times$ *their x* only if answer is positive **M1** for [angle AOC =] $22 \times$ *their x*

(b) (i)	37.7 or 37.69 to 37.704 nfww	**2**	**M1** for $6\pi + 4\pi \pm 2\pi$ oe
(ii)	12100, 12060, 12070, 12062.4 to 12065.6 nfww	**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 = *their* area × 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 A with correct intersecting arcs	**2**	**B1** for accurate with no/wrong arcs or **M1** for correct intersecting arcs
(c)	Complete circle drawn with AD as tangent	**1**	
(d)	Correct angle and Y marked on BC with correct arcs	**2**	**B1** for accurate angle with arcs or Y on BC without correct arcs
11 (a)	$\frac{At}{t+r}$ final answer oe nfww	**4**	**B1** for $t(A-x) = xr$ or $tA - tx = xr$ or $A = \frac{xr}{t} + x$ **M1** for correctly completing multiplication by t (eliminating any bracket) and x terms isolated **M1** for correct factorisation **M1** dep for correct division
(b)	$[a =]$ 64	**3**	**B1** for $2b = -16$ or $(x-8)^2$
	$[b =]$ −8		**B1** for $a = (\textit{their } b)^2$
			If **0** scored, **SC1** for $x^2 + 2bx + b^2$ soi

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