UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

0580 MATHEMATICS

0580/41 Paper 4 (Extended), maximum raw mark 130

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UNIVERSITY *of* CAMBRIDGE
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Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1 (a)	1134	**3**	**M2** for $\dfrac{504}{12} \times (12 + 7 + 8)$ soi by answer of 1130 or **B1** for 27 or 42 or 294 or 336 seen
(b) (i)	468.72	**3**	**M2** for $\dfrac{93}{100} \times 504$ oe soi by 468.7 or 469 or **M1** for $\dfrac{7}{100} \times 504$ (implied by 35.28)
(ii)	84	**3**	**M2** for $\dfrac{64.68}{77} \times 100$ or **M1** for $(100 - 23)\% = 64.68$
(c)	262.19 cao	**3**	**M2** for 250×1.016^3 oe implied by answer 262.2 or better or **M1** for 250×1.016^n oe $n > 2$ seen
(d)	12.5%	**3**	**M2** for $\dfrac{324 - 288}{288} \times 100$ or **M1** for $\dfrac{324}{288} \times 100$ (112.5) or $\dfrac{36}{288}$ (0.125)
2 (a)	10.9 or 10.92… www 4	**4**	**M2** for $4^2 + 9^2 - 2 \times 4 \times 9 \times \cos 108$ If **M0**, **M1** for correct implicit statement **A1** for 119.249...(which can be 3 www)
(b) (i)	5.16 or 5.162….. www 3	**3**	**M2** for $9 \times \cos 55$ oe in correct triangle If **M0**, **B1** for 55 or 35 in correct position soi
(ii)	(0)53	**B2**	**SC1** for answer 233

3	(a)		1 0.98(4) 0 − 0.98(4) − 1	B3	B2 for 4 correct, B1 for 3 correct
	(b)		9 points plotted	P3ft	B2 for 7 or 8 points correct B1 for 5 or 6 points correct
			smooth curve	C1	correct **cubic** shape through 8 or more points from – 2 to 2
	(c)	(i)	$y = 0.8$ drawn	B1	Accept good freehand To make the three possible intersections (otherwise the line must be from – 2 to 2)
		(ii)	−1.1 to −1.2, −0.4 to −0. 5, 1.55 to 1.65	1, 1, 1	
	(d)		correct tangent drawn at $x = − 1.5$ 4 to 5.5	T1 B2	Allow slight daylight dep on T1 M1 for evidence rise/run with correct scales dep on T1
4	(a)		90	B1	
	(b)		$\tan(ACB) = 7 \div 10$ oe 34.9(9...)	M1 A1	Any longer method must reach equivalent stage
	(c)		**same segment**	B1	Allow **same arc** oe
	(d)	(i)	11.9 or 11.8(9....) www 3	3	M2 for $\dfrac{7 \times \sin 77}{\sin 35}$ or M1 for implicit form
		(ii)	38.6 (38.58 to 38.62) www 2	2	M1 for $0.5 \times 7 \times$ *their* (d)(i) $\times \sin(180 – 77 – 35)$ oe Allow 68.00 to 68.01 for 68
	(e)		8.69 or 8.7(0) or 8.685 to 8.700…. cao www 3	3	M2 for $12.3 \times \left(\dfrac{10}{their\ 11.9}\right)^2$ or M1 for $\left(\dfrac{10}{their\ 11.9}\right)^2$ or reciprocal seen
5	(a)	(i)	2.8 cao	1	accept 2 (h) 48, not 2.48
		(ii)	3.8 cao	1	accept 3 (h) 48 not 3.48
		(iii)	1.8 cao	1ft	ft their (a)(ii) – 2 accept 1 (h) 48 and 1.48
	(b)		6	1	
	(c)	(i)	9, 4, 4	2	B1 for 2 correct

(ii)	1 2.5 3.5 4.5 5.5 7	**M1**	At least 5 correct mid-values seen
	$20 \times 1 + 25 \times 2.5 + 18 \times 3.5 +$ *their* $9 \times 4.5 +$ *their* $4 \times 5.5 +$ *their* 4×7 $(= 236)$	**M1**	$\sum fx$ where x is in the correct interval $(20 + 62.5 + 63 + 40.5 + 22 + 28)$
	$\div 80$	**M1**	Dependent on second method mark
	2.95 cao	**A1**	Allow www 4
(d)	Axes suitably numbered **or** horizontal axis suitably numbered **and** area scale stated	**1**	e.g. $4\text{cm}^2 = 10$
	6 columns with correct relative widths	**1**	no gaps, but condone reasonable freehand

	heights: 10
	          25, 18, *their* 9, *their* 4
	                  their $4 \div 2$
		1
		 1
		 1
			if vertical axis not labelled use correct relative heights

6 (a) (i)	$(4x - 7)(2x - 1) = 1$ $8x^2 - 14x - 4x + 7$ $4x^2 - 9x + 3 = 0$	**M1** **B1** **E1**	or $(4x - 7)(2x - 1) - 1 = 0$ only allow $- 18x$ and/or $+ 6 = 0$ or $= - 6$ at least one more line e.g. $8x^2 - 18x + 6 = 0$ with no errors or omissions seen
(ii)	$(x =) \dfrac{-(-9) \pm \sqrt{(-9)^2 - 4(4)(3)}}{2 \times 4}$ $(x =)$ 0.41, 1.84 cao	**B2** **B1,B1**	**B1** for $\sqrt{(-9)^2 - 4(4)(3)}$ or better seen $(\sqrt{33})$ **B1** for $p = -(-9)$ and $r = 2 \times 4$ or better as long as in the form $\dfrac{p + or - \sqrt{q}}{r}$ After B0B0, **SC1** for 0.4 or 0.406(929...) and 1.8 or 1.843(070...)
(iii)	0.36 or 0.3720 to 0.3724 or 0.37	**B1ft**	ft their value to give positive $(4x - 7)$
(b) (i)	$(x - 4)(x + 4)$	**B1**	
(ii)	$(2x + 3)(x + 4) + (x + 40) = 2(x^2 - 16)$ oe $2x^2 + 8x + 3x + 12$ or $2x^3 + 3x^2 - 32x - 48$ $x = -7$ www 4	**M2** **B1** **A1**	fractions cleared or could all still be over $(x^2 - 16)$ or $(2x + 3)(x^2 - 16) + (x + 40)(x - 4) = 2(x - 4)(x^2 - 16)$ Condone sign slips

7		**In any part of part (a) all marks are independent but mention of a second transformation scores 0 out of 3**		
	(a) (i)	Rotation (centre/about) origin (O) (0,0) 180°	1 1 1	accept R **SC3** for all of enlargement, sf – 1, (0, 0)
	(ii)	Enlargement (centre/about) (0,– 3) SF – 3	1 1 1	accept E
	(iii)	Enlargement (centre/about) (0, 6) SF $\frac{1}{3}$	1 1 1	accept E
	(b) (i)	image at (–4, –2) (–2, –2) and (–1, 0)	2	**SC1** for translation by $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$, $k \neq 0$
	(ii)	image at (– 2, 3) (– 4, 3) and (– 5, 5)	2	**SC1** for reflection in $y = -1$
	(c) (i)	image at (0, 3) (4, 3) and (6, 5)	2	**SC1** for stretch sf 2 with x-axis invariant ie at (0,6) (2,6) (3,10)
	(ii)	$\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ ft	2 ft	ft their stretch factor only **SC1** for correct left hand column ft or $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ ft
8 (a)		2 4 6 8	1	
(b)		3	1	
(c) (i)		$(x-4)(x-9)$	2	**SC1** any other $(x+a)(x+b)$ where $a \times b = 36$ or $a + b = -13$
(ii)		4 9	**B1 ft**	ft or can recover
(d)			2	Must have all 9 numbers on diagram and no extras **SC1** for 5 or more correct elements
(e) (i)		$\varnothing$ or { } cao	1	
(ii)		$\notin$ cao	1	
(iii)		$\cup$ cao	1	

9 (a) (i)	14	1	
(ii)	$13 - 2x$	2	**M1** for $7 - 2(x - 3)$
(iii)	$25x^2 - 8$ final answer	1	
(b)	$\dfrac{7 - x}{2}$ oe	2	**M1** for $2x = 7 - y$, $x = \dfrac{7 - y}{2}$ oe or $x = 7 - 2y$, $2y = 7 - x$ oe i.e one step from answer
(c)	$9x^2 + 30x + 17$	3	**M1** for $(3x + 5)^2 - 8$ seen **B1** for $9x^2 + 30x + 25$
(d)	7 cao	3	**M2** for $3(3x + 5) + 5 = 83$ or better or **B1** for $3(3x + 5) + 5$ oe
(e)	$x < -\dfrac{3}{8}$ oe cao	3	**M1** for $2(3x + 5) < 7 - 2x$ oe **B1** for $8x * -3$ or $-8x * 3$ Do not accept $\dfrac{3}{-8}$
10 (a)	2030 or 2040 or 2034 to 2036. (…)	2	$(V =) \frac{1}{3} \times \pi \times 9^2 \times 24$ Accept 648π for 2 marks if final answer
(b)	(upper radius =) 3	**B1**	accept $9 \times \dfrac{8}{24}$ oe
	(vol cut off =) $\frac{1}{3} \times \pi \times$ their $3^2 \times 8$	**M1**	(= 75.36 to 75.41) their r must be less than 9
	their (a) – their 75.39	**M1** dep	[alternate method **M1** for ratio sides 1:3 **M1** ratio vols 1 : 27 **M1** their (a) $\times 26 \div 27$] 624π implies **B1 M2** or **M3**
	1958 to 1964.(...)	**E1**	must see a figure after decimal point if 1960
(c)	$1960 = 5 \times \pi \times r^2 \times 15$ soi	**M1**	
	$r^2 = 1960 \div \pi \div 15 \div 5$	**M1**	implied by 8.318...
	$\sqrt{}$ their 8.318	**M1**	dep on **M1 M1** **SC2** for $5 \times \pi \times 2.9^2 \times 15 = 1980$ to 1982
	2.88 to 2.89	**E1**	