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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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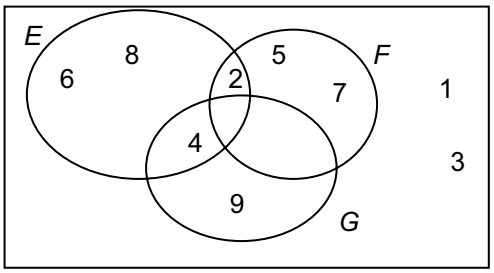
Abbreviations

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 $\frac{504}{12} \times (12 + 7 + 8)$ soi by answer of 1130 or **B1** for 27 or 42 or 294 or 336 seen
(b) (i)	468.72	**3**	**M2** for $\frac{93}{100} \times 504$ oe soi by 468.7 or 469 or **M1** for $\frac{7}{100} \times 504$ (implied by 35.28)
(ii)	84	**3**	**M2** for $\frac{64.68}{77} \times 100$ 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 $\frac{324 - 288}{288} \times 100$ or **M1** for $\frac{324}{288} \times 100$ (112.5) or $\frac{36}{288}$ (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 × 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 ÷ 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 $\frac{7 \times \sin 77}{\sin 35}$ or **M1** for implicit form
	(ii)	38.6 (38.58 to 38.62) www 2	**2**	**M1** for 0.5 × 7 × *their* (d)(i) × 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 $12.3 \times \left(\frac{10}{\textit{their}\ 11.9}\right)^2$ or **M1** for $\left(\frac{10}{\textit{their}\ 11.9}\right)^2$ 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 × 1 + 25 × 2.5 + 18 × 3.5 + *their* 9 × 4.5 + *their* 4 × 5.5 + *their* 4 × 7 (= 236)	**M1**	$\sum fx$ where x is in the correct interval (20 + 62.5 + 63 + 40.5 + 22 + 28)
	÷ 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 ÷ 2	**1** **1** **1**	if vertical axis not labelled use correct relative heights
6 (a) (i)	$(4x-7)(2x-1)=1$	**M1**	or $(4x-7)(2x-1)-1=0$ only
	$8x^2-14x-4x+7$	**B1**	allow $-18x$ and/or $+6=0$ or $=-6$
	$4x^2-9x+3=0$	**E1**	at least one more line e.g. $8x^2-18x+6=0$ with no errors or omissions seen
(ii)	$(x=)\ \dfrac{-(-9)\pm\sqrt{(-9)^2-4(4)(3)}}{2\times4}$	**B2**	**B1** for $\sqrt{(-9)^2-4(4)(3)}$ or better seen ($\sqrt{33}$) **B1** for $p=-(-9)$ and $r=2\times4$ or better as long as in the form $\dfrac{p+or-\sqrt{q}}{r}$
	$(x=)$ 0.41, 1.84 cao	**B1,B1**	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	**M2**	fractions cleared or could all still be over (x^2-16) or $(2x+3)(x^2-16)+(x+40)(x-4)=2(x-4)(x^2-16)$
	$2x^2+8x+3x+12$ or $2x^3+3x^2-32x-48$	**B1**	Condone sign slips
	$x=-7$ www 4	**A1**	

7	**In any part of part (a) all marks are independent but mention of a second transform … 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)	∅ or { } cao	**1**	
(ii)	∉ cao	**1**	
(iii)	∪ 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)	$\frac{7-x}{2}$ oe	**2**	**M1** for $2x=7-y$, $x=\frac{7-y}{2}$ 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)	$x<-\frac{3}{8}$ oe cao	**3**	**M1** for $2(3x+5)<7-2x$ oe **B1** for $8x$ * -3 or $-8x$ * 3 Do not accept $\frac{3}{-8}$
10 (a)	2030 or 2040 or 2034 to 2036. (…)	**2**	$(V=)\frac{1}{3}\times\pi\times9^2\times24$ Accept 648π for 2 marks if final answer
(b)	(upper radius =) 3	**B1**	accept $9\times\frac{8}{24}$ oe
	(vol cut off =) $\frac{1}{3}\times\pi\times their\ 3^2\times8$	**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) × 26 ÷ 27] 624π implies **B1 M2** or **M3**
	1958 to 1964.(...)	**E1**	must see a figure after decimal point if 1960
(c)	$1960=5\times\pi\times r^2\times15$ soi	**M1**	
	$r^2=1960\div\pi\div15\div5$	**M1**	implied by 8.318...
	√ *their* 8.318	**M1**	dep on **M1 M1**
	2.88 to 2.89	**E1**	**SC2** for $5\times\pi\times2.9^2\times15=1980$ to 1982