UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 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)	**(i)** $\frac{1380}{62+53}\times 62$	1	Allow 115 for 62 + 53
	(ii) 7.27 (7.271 to 7.272)	1	
	(iii) 42	2	M1 for $\frac{3150}{75}$ oe
(b)	**(i)** 235	3	B2 for angle $ACS = 55$ or angle $ACN = 125$ B1 for 55 seen
	(ii) 12.6 (12.58 to 12.59)	3	M2 for $\frac{4}{6}\times 18.9$ or $4+4+2\times 4\times\cos 55$ or $4+4+2\times 4\times\sin 35$ oe (M1 for $\frac{4}{6}$ soi or $2\times 4\times\cos 55$ or $2\times 4\times\sin 35$ soi oe)
(c)	1500	3	M2 for $\frac{1380}{1-0.08}$ oe (M1 for recognition that 92% = 1380)

2 (a)	Monday $\frac{3}{5}$, $\frac{2}{5}$	1	
	Tuesday $\frac{4}{7}$, $\frac{3}{7}$	1	
	$\frac{5}{7}$, $\frac{2}{7}$	1	
(b)	**(i)** $\frac{12}{35}$ oe cao	2	M1 $\frac{3}{5}\times\frac{4}{7}$ ft their tree
	(ii) $\frac{9}{35}$ oe cao	2	M1 $\frac{3}{5}\times\frac{3}{7}$ ft their tree
	(iii) $\frac{19}{35}$ oe	2 **ft**	ft their **(b)(ii)** + $\frac{10}{35}$ ft their tree throughout **(iii)** M1 for $\frac{2}{5}\times\frac{5}{7}$ + their **(b)(ii)** or $1-\frac{3}{5}\times\frac{4}{7}-\frac{2}{5}\times\frac{2}{7}$
(c)	$\frac{34}{35}$ oe cao	3	ft their tree throughout **(iv)** M2 for $1-\frac{2}{5}\times\frac{2}{7}\times\frac{1}{4}\left(=1-\frac{1}{35}\right)$ (M1 for $\frac{2}{5}\times\frac{2}{7}\times\frac{1}{4}\left(=\frac{1}{35}\right)$) or M2 for $\frac{3}{5}+\frac{2}{5}\times\frac{5}{7}+\frac{2}{5}\times\frac{2}{7}\times\frac{3}{4}$ (M1 for any two of these)
3 (a)	3 www	3	M1 for $p=\frac{k}{(m+1)}$ oe A1 for $k=36$ or M2 for $4\times 9=p\times 12$ oe
(b)	**(i)** $(x+5)(x-5)$	1	
	(ii) $\frac{(2x+1)}{(x-5)}$ final answer	3	B2 for factors $(2x+1)(x+5)$ or SC2 for final answer $\frac{x+\frac{1}{2}}{x-5}$ (B1 for $(2x+a)(x+b)$ where $ab=5$ or $2b+a=11$ or SC1 for $(x+\frac{1}{2})(x+5)$)
(c)	$x<7$ oe final answer	3	M2 for $8x$ * 56 where * is inequality or = sign (B1 for $5x-20$ or $36-3x$)

4 (a)	**(i)** $(\cos(HFG)) = \dfrac{6^2+14^2-12^2}{2\times6\times14}$	M2	M1 for implicit form
	58.4 (58.41…)	A2	A1 for 0.5238…
	(ii) 0.5 × 6 × 14 × sin (their 58.4) oe	M1	ft their **(i)**
	35.8 or 35.77 to 35.78	A1**ft**	Correct or ft their **(i)**
(b)	$(\sin(RQP)) = \dfrac{\sin(117)\times12}{18}$	M2	M1 for implicit form
	36.4 or 36.44...	A1	
5 (a)	**(i)** Correct translation (see diagram)	2	SC1 for translation by $\begin{pmatrix}-3\\k\end{pmatrix}$ or by $\begin{pmatrix}k\\-2\end{pmatrix}$
	(ii) Correct reflection (see diagram)	2	SC1 for reflection in $y = -1$
(b)	**(i)** Stretch,	1	
	(factor) 3,	1	
	y-axis or $x = 0$ invariant	1	
	(ii) Rotation	1	
	90° clockwise	1	Accept –90°
	(1, – 1)	1	
(c)	**(i)** $\begin{pmatrix}3&0\\0&1\end{pmatrix}$ ft from **(b)(i)**	2 **ft**	SC1 for $\begin{pmatrix}1&0\\0&3\end{pmatrix}$ (ft from **(b)(i)**) or $\begin{pmatrix}k&0\\0&1\end{pmatrix}$ with k algebraic or numeric but ≠ 1 or 0
	(ii) Rotation,	1	
	180°	1	
	Origin	1	Accept O or (0,0)
6 (a)	23.6 (23.60…)	2	M1 for $14^2 + 19^2$
(b)	2300 or 2303 to 2304 cao	4	M3 for 2 × ½ × 14 × 19 + 14 × 36 + 19 × 36 + their BC × 36 M2 for 4 of these added M1 for ½ × 14 × 19
(c)	4788 or 4790 cao	2	M1 their triangle area × 36
(d)	43(.0) or 43.04 to 43.05 cao	2	M1 for (their **(a)**)$^2 + 36^2$ or $36^2 + 19^2 + 14^2$
(e)	18.9° to 19.02° cao	3	M2 for inv sin $\left(\dfrac{14}{\text{their } CE}\right)$ or inv tan $\left(\dfrac{14}{\sqrt{19^2+36^2}}\right)$ or inv cos $\left(\dfrac{\sqrt{19^2+36^2}}{\text{their } CE}\right)$ or complete longer methods (M1 for clearly identifying angle CEA)

7 (a)	1(.00) 4(.00) 11.1(1) 1(.00) 0.25	3	B2 for 4 correct, B1 for 3 correct
(b)	10 points plotted	P3 **ft**	B2 for 8 or 9 points correct ft B1 for 6 or 7 points correct ft
	Correct shaped curve through 10 points (condone 2 points slightly missed)	C1 **ft**	ft their points if shape correct – ignore anything between – 0.6 and 0.6
	2 separate curves not crossing x-axis and not touching or crossing y-axis	B1	Independent
(c)	–0.85 to – 0.75 cao	1	
	0.75 to 0.85 cao	1	
(d)	Tangent drawn (ruled) at $x = 1.5$	T1	Allow slight daylight
	– 3 to –2	2	**Dep** on T1 M1 evidence rise/run **dependent** on tangent SC1 for answer in range 2 to 3 Answer implies M but not the T mark
(e)	**(i)** $y = x - 2$ oe	1	
	(ii) line ruled to cross curve	2 **ft**	Dependent on **(i)** in form $y = mx + c$, $m \neq 0$, $c \neq 0$ B1 for gradient ft or y intercept ft but again to cross curve at all possible points
	(iii) 2.5 to 2.7 cao	1	Dependent on **(e)(i)** correct
8	14.2	3	M1 for Σfx $(10 \times 11 + 8 \times 12 + 16 \times 13 + 11 \times 14 + 7 \times 15 + 8 \times 16 + 6 \times 17 + 9 \times 18)$ (1065) (allow one error or omission) M1dep for $\div \Sigma f$ $(10 + 8 + 16 + 11 + 7 + 8 + 6 + 9)$ (75) (allow one further error or omission)
	14	2	M1 for 37th, 37.5th or 38th seen
	13	1	
(b)	**(i)** 21, 30, 15	2	B1 for 2 correct
	(ii) 20 20 10 (10) 1.05 1.5 1.5 (0.9)	3	1, 1, 1 for each correct vertical pair
(c)	$\frac{10 \times 2.5 + 12 \times 3 + 4n}{10 + 12 + n} (= 3.1)$	M2	M1 for either numerator or denominator seen
	multiplying across and collecting terms	M1	dep on linear numerator and denominator their $(68.2 - 25 - 36) =$ their $(4 - 3.1) \times n$
	$(n =)$ 8 www 4	A1	

9 (a)	$x \geqslant 3$ $y \geqslant 2$	1, 1	
(b)	$x + y \leqslant 9$	1	
(c)	$6x + 14y \leqslant 84$	1	
(d)	$x = 3$ $y = 2$	1, 1	Accept clear and freehand lines long enough to define the correct quadrilateral
	$x + y = 9$	2	SC1 for line through (0, 9) or (9, 0)
	Line from (0, 6) to (14, 0)	2	B1 for through (0, 6) or (14, 0)
	Correct quadrilateral unshaded or clearly indicated	1	
(e)	\$ 70	2	B1 for considering (7, 2)
10 (a)	(A 1) 8 27 64 125	2	B1 for 3 correct
	(B 4) 8 12 16 20	1	
	(C 4) 9 16 25 36	2	B1 for 3 correct
(b)	512	1	
	169	1	
(c)	25	1	
	99	1	
(d)	145 $n^3 + 4n$ oe	1, 1	
	16 $(n + 1)^2 - 4n$ oe but isw	1, 1	Likely oe is $(n - 1)^2$