## 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 $92\% = 1380$ )

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		Т	
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 <b>ft</b>	ft their <b>(b)(ii)</b> + $\frac{10}{35}$ ft their tree throughout <b>(iii)</b>
			M1 for $\frac{2}{5} \times \frac{5}{7}$ + their <b>(b)(ii)</b> 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) $M2 \text{ for } 1 - \frac{2}{5} \times \frac{2}{7} \times \frac{1}{4} \left( = 1 - \frac{1}{35} \right)$
			$(M1 \text{ for } \frac{2}{5} \times \frac{2}{7} \times \frac{1}{4} \left( = \frac{1}{35} \right))$
			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 $36 - 3x$ )

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4 (a)	(i) $(\cos{(HFG)}) = \frac{6^2 + 14^2 - 12^2}{2 \times 6 \times 14}$	M2	M1 for implicit form
	58.4 (58.41)	A2	A1 for 0.5238
	(ii) $0.5 \times 6 \times 14 \times \sin$ (their 58.4) oe	M1	ft their (i)
	35.8 or 35.77 to 35.78	Alft	Correct or ft their (i)
(b)	$(\sin(RQP)) = \frac{\sin(117) \times 12}{18}$	M2	M1 for implicit form
	36.4 or 36.44	A1	
			(-3) $(k)$
5 (a)	(i) Correct translation (see diagram)	2	SC1 for translation by $\binom{-3}{k}$ or by $\binom{k}{-2}$
	(ii) Correct reflection (see diagram)	2	SC1 for reflection in $y = -1$
<b>(b)</b>	(i) Stretch,	1	
	(factor) 3, y-axis or $x = 0$ invariant	1 1	
	(ii) Rotation	1	
	90° clockwise	1	Accept –90°
	(1, -1)	1	•
	(2 0)		(1.0)
(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>(b)(i)</b> ) or $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix}$
			with $k$ algebraic or numeric but $\neq 1$ 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 \times \frac{1}{2} \times 14 \times 19 + 14 \times 36 + 19 $
			their $BC \times 36$ M2 for 4 of these added
			M1 for $\frac{1}{2} \times 14 \times 19$
	4700 - 4700		
(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)) <sup>2</sup> + 36 <sup>2</sup> or $36^2 + 19^2 + 14^2$
(e)	18.9° to 19.02° cao	3	M2 for inv sin $\left(\frac{14}{\text{their }CE}\right)$ or
			$\operatorname{inv} \tan \left( \frac{14}{\sqrt{19^2 + 36^2}} \right) \text{ or }$
			inv $\cos\left(\frac{\sqrt{19^2 + 36^2}}{\text{their } CE}\right)$ or complete longer
			methods
			(M1 for clearly identifying angle <i>CEA</i> )

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		1	
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
	Correct shaped curve through 10 points	C1 ft	B1 for 6 or 7 points correct ft ft their points if shape correct – ignore anything
	(condone 2 points slightly missed) 2 separate curves not crossing <i>x</i> -axis and not touching or crossing <i>y</i> -axis	B1	between – 0.6 and 0.6 Independent
(c)	-0.85  to - 0.75  cao	1	
	0.75 to 0.85 cao	1	
(d)	Tangent drawn (ruled) at $x = 1.5$ - 3 to -2	T1 2	Allow slight daylight  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		Dependent on (i) in form $y = mx + c$ , $m \ne 0$ , $c \ne 0$ B1 for gradient ft or y intercept ft but again to cross curve at all possible points
	(iii) 2.5 to 2.7 cao		Dependent on (e)(i) correct
8	14.2	3	M1 for $\Sigma fx$ (10 × 11 + 8 × 12 + 16 × 13 + 11 × 14 + 7 × 15 + 8 × 16 + 6 × 17 + 9 × 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 13	2	M1 for 37th, 37.5th or 38th seen
(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
	(n=) 8 www 4	A1	their $(68.2 - 25 - 36)$ = their $(4 - 3.1) \times n$

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9 (a)	$x \ge 3$ $y \ge 2$	1, 1	
(b)	$x + y \le 9$	1	
(c)	$6x + 14y \le 84$	1	
(d)	x=3 $y=2$	1, 1	Accept clear and freehand lines long enough to
	x + y = 9	2	define the correct quadrilateral 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 (C 4) 9 16 25 36	1 2	B1 for 3 correct
	(C 4) 9 10 23 30	2	Bi for 5 correct
(b)	512	1	
	169	1	
(c)	25	1	
	99	1	
(d)	$145   n^3 + 4n$ oe	1, 1	
(u)	$\frac{143}{16} \frac{n+4n}{(n+1)^2-4n}$ oe but isw	1, 1	Likely oe is $(n-1)^2$