## 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

## 0581 MATHEMATICS

0581/41

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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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0581	41

## **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 $4+4+2\times4\times\cos55$ or $4+4+2\times4\times\sin35$ oe
			$(M1 \text{ for } \frac{4}{6} \text{ soi or } 2 \times 4 \times \cos 55 \text{ or}$
			$2\times4\times\sin35$ soi oe)
(c)	1500	3	M2 for $\frac{1380}{1-0.08}$ oe (M1 for recognition that $92\% = 1380$ )

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0581	41

	1	
Monday $\frac{3}{5}$ , $\frac{2}{5}$	1	
Tuesday $\frac{4}{7}$ , $\frac{3}{7}$	1	
$\frac{5}{7}$ , $\frac{2}{7}$	1	
(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 $1 - \frac{3}{5} \times \frac{4}{7} - \frac{2}{5} \times \frac{2}{7}$
$\frac{34}{35}$ 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 www	3	M1 for $p = \frac{k}{(m+1)}$ oe A1 for $k = 36$
		or M2 for $4 \times 9 = p \times 12$ oe
(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 $(x + \frac{1}{2})(x + 5)$ )
x < 7 oe final answer	3	M2 for $8x * 56$ where * is inequality or = sign (B1 for $5x - 20$ or $36 - 3x$ )
	Tuesday $\frac{4}{7}$ , $\frac{3}{7}$ $\frac{5}{7}$ , $\frac{2}{7}$ (i) $\frac{12}{35}$ oe cao (ii) $\frac{9}{35}$ oe cao (iii) $\frac{19}{35}$ oe cao 3 www (i) $(x+5)(x-5)$ (ii) $\frac{(2x+1)}{(x-5)}$ final answer	Tuesday $\frac{4}{7}$ , $\frac{3}{7}$ $\frac{5}{7}$ , $\frac{2}{7}$ 1  (i) $\frac{12}{35}$ oe cao 2  (ii) $\frac{9}{35}$ oe cao 2  (iii) $\frac{19}{35}$ oe cao 3  (i) $(x+5)(x-5)$ 1  (ii) $\frac{(2x+1)}{(x-5)}$ final answer 3

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0581	41

4 (a)	(i) $(\cos{(HFG)}) = \frac{6^2 + 14^2 - 12^2}{2 \times 6 \times 14}$		
	$\frac{(1)  (\cos{(1170)}) - \frac{1}{2 \times 6 \times 14}}{2 \times 6 \times 14}$	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	A1ft	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	
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	
	<i>y</i> -axis or $x = 0$ invariant	1	
	(ii) Rotation 90° clockwise	1 1	Appent 00°
	(1,-1)	1	Accept –90°
(c)	(i) $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ ft from (b)(i)	2 <b>ft</b>	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>(b)</b>	2300 or 2303 to 2304 cao	4	M3 for $2 \times \frac{1}{2} \times 14 \times 19 + 14 \times 36 + 19 \times 36 + \frac{1}{2} \times 1$
			their $BC \times 36$
			M2 for 4 of these added M1 for $\frac{1}{2} \times 14 \times 19$
(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)) <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> )

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0581	41

		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	B1	between – 0.6 and 0.6 Independent
	not touching or crossing y-axis		macpenaem
(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 <b>Dep</b> on T1
	- 3 to -2	2	M1 evidence rise/run <b>dependent</b> 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	<b>F</b>
	(ii) line ruled to cross curve	2 <b>ft</b>	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 ×
			$14 + 7 \times 15 + 8 \times 16 + 6 \times 17 + 9 \times 18$ ) (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		
	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)	3	1, 1, 1 for each correct vertical pair
	1.05 1.5 1.5 (0.9)		
(c)	$\frac{10 \times 2.5 + 12 \times 3 + 4n}{10 + 12 + n} (= 3.1)$	M2	M1 for either numerator or denominator seen
	10+12+n		
	multiplying across and collecting terms	M1	dep on linear numerator and denominator their $(68.2 - 25 - 36) = \text{their } (4 - 3.1) \times n$
	(n=) 8 www 4	A1	uicii (00.2 – 23 – 30) – uicii (4 – 3.1) × 11

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2011	0581	41

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) Correct quadrilateral unshaded or clearly indicated	2	B1 for through (0, 6) or (14, 0)
(e)	\$ 70	2	B1 for considering (7, 2)
10(a)	(A 1) 8 27 64 125 (B 4) 8 12 16 20	2	B1 for 3 correct
	(B 4) 8 12 16 20 (C 4) 9 16 25 36	2	B1 for 3 correct
(b)	512 169	1 1	
(c)	25 99	1 1	
(d)	145 $n^3 + 4n$ oe 16 $(n+1)^2 - 4n$ oe but isw	1, 1 1, 1	Likely oe is $(n-1)^2$