

**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
<b>1 (a)</b>	<b>(i)</b> $\frac{1380}{62 + 53} \times 62$	1	Allow 115 for 62 + 53
	<b>(ii)</b> 7.27 (7.271 to 7.272)	1	
	<b>(iii)</b> 42	2	M1 for $\frac{3150}{75}$ oe
<b>(b)</b>	<b>(i)</b> 235	3	B2 for angle $ACS = 55$ or angle $ACN = 125$ B1 for 55 seen
	<b>(ii)</b> 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)
<b>(c)</b>	1500	3	M2 for $\frac{1380}{1 - 0.08}$ oe (M1 for recognition that 92% = 1380)

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<b>2 (a)</b>	Monday $\frac{3}{5}, \frac{2}{5}$	1	
	Tuesday $\frac{4}{7}, \frac{3}{7}$	1	
	$\frac{5}{7}, \frac{2}{7}$	1	
<b>(b)</b>	<b>(i)</b> $\frac{12}{35}$ oe cao	2	M1 $\frac{3}{5} \times \frac{4}{7}$ ft their tree
	<b>(ii)</b> $\frac{9}{35}$ oe cao	2	M1 $\frac{3}{5} \times \frac{3}{7}$ ft their tree
	<b>(iii)</b> $\frac{19}{35}$ oe	2 ft	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 $1 - \frac{3}{5} \times \frac{4}{7} - \frac{2}{5} \times \frac{2}{7}$
<b>(c)</b>	$\frac{34}{35}$ oe cao	3	ft their tree throughout <b>(iv)</b> 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)
<b>3 (a)</b>	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>(b)</b>		
	<b>(i)</b> $(x+5)(x-5)$	1	
<b>(ii)</b> $\frac{(2x+1)}{(x-5)}$ 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 $(x+\frac{1}{2})(x+5)$ )	
<b>(c)</b>	$x < 7$ 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)	<p>(i) <math>\cos(HFG) = \frac{6^2 + 14^2 - 12^2}{2 \times 6 \times 14}</math> 58.4 (58.41...)</p> <p>(ii) <math>0.5 \times 6 \times 14 \times \sin(\text{their } 58.4)</math> oe 35.8 or 35.77 to 35.78</p> <p>(b) <math>\sin(RQP) = \frac{\sin(117) \times 12}{18}</math> 36.4 or 36.44...</p>	<p>M2 A2 M1 A1ft  M2 A1</p>	<p>M1 for implicit form A1 for 0.5238... ft their (i) Correct or ft their (i)  M1 for implicit form</p>
5 (a)	<p>(i) Correct translation (see diagram)</p> <p>(ii) Correct reflection (see diagram)</p> <p>(b) (i) Stretch, (factor) 3, y-axis or <math>x = 0</math> invariant</p> <p>(ii) Rotation 90° clockwise (1, -1)</p> <p>(c) (i) <math>\begin{pmatrix} 3 &amp; 0 \\ 0 &amp; 1 \end{pmatrix}</math> ft from (b)(i)</p> <p>(ii) Rotation, 180° Origin</p>	<p>2 2 1 1 1 1 1 1 2 ft 1 1 1</p>	<p>SC1 for translation by <math>\begin{pmatrix} -3 \\ k \end{pmatrix}</math> or by <math>\begin{pmatrix} k \\ -2 \end{pmatrix}</math> SC1 for reflection in <math>y = -1</math>  Accept <math>-90^\circ</math>  SC1 for <math>\begin{pmatrix} 1 &amp; 0 \\ 0 &amp; 3 \end{pmatrix}</math> (ft from (b)(i)) or <math>\begin{pmatrix} k &amp; 0 \\ 0 &amp; 1 \end{pmatrix}</math> with <math>k</math> algebraic or numeric but <math>\neq 1</math> or 0  Accept <math>O</math> or (0,0)</p>
6 (a)	<p>23.6 (23.60...)</p> <p>(b) 2300 or 2303 to 2304 cao</p> <p>(c) 4788 or 4790 cao</p> <p>(d) 43(.0) or 43.04 to 43.05 cao</p> <p>(e) 18.9° to 19.02° cao</p>	<p>2 4 2 2 3</p>	<p>M1 for <math>14^2 + 19^2</math> M3 for <math>2 \times \frac{1}{2} \times 14 \times 19 + 14 \times 36 + 19 \times 36 +</math> their <math>BC \times 36</math> M2 for 4 of these added M1 for <math>\frac{1}{2} \times 14 \times 19</math> M1 their triangle area <math>\times 36</math> M1 for (their (a))<sup>2</sup> + 36<sup>2</sup> or 36<sup>2</sup> + 19<sup>2</sup> + 14<sup>2</sup> M2 for <math>\text{inv sin} \left( \frac{14}{\text{their } CE} \right)</math> or <math>\text{inv tan} \left( \frac{14}{\sqrt{19^2 + 36^2}} \right)</math> or <math>\text{inv cos} \left( \frac{\sqrt{19^2 + 36^2}}{\text{their } CE} \right)</math> or complete longer methods (M1 for clearly identifying angle <math>CEA</math>)</p>

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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  Correct shaped curve through 10 points (condone 2 points slightly missed) 2 separate curves not crossing $x$ -axis and not touching or crossing $y$ -axis	P3 ft C1 ft B1	B2 for 8 or 9 points correct ft B1 for 6 or 7 points correct ft ft their points if shape correct – ignore anything between $-0.6$ and $0.6$ Independent
(c)	$-0.85$ to $-0.75$ cao $0.75$ to $0.85$ cao	1 1	
(d)	Tangent drawn (ruled) at $x = 1.5$ $-3$ to $-2$	T1 2	Allow slight daylight <b>Dep</b> on T1 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  (ii) line ruled to cross curve  (iii) $2.5$ to $2.7$ cao	1 2 ft 1	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  Dependent on (e)(i) correct
8	14.2  14 13  (b) (i) 21, 30, 15 (ii) 20      20      10      (10) 1.05    1.5      1.5      (0.9)  (c) $\frac{10 \times 2.5 + 12 \times 3 + 4n}{10 + 12 + n} (= 3.1)$  multiplying across and collecting terms  ( $n =$ ) 8    www 4	3  2 1  2 3  M2  M1 A1	M1 for $\Sigma fx$ ( $10 \times 11 + 8 \times 12 + 16 \times 13 + 11 \times 14 + 7 \times 15 + 8 \times 16 + 6 \times 17 + 9 \times 18$ ) (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)  M1 for 37th, 37.5th or 38th seen  B1 for 2 correct  1, 1, 1 for each correct vertical pair  M1 for either numerator or denominator seen  dep on linear numerator and denominator their $(68.2 - 25 - 36) =$ their $(4 - 3.1) \times n$

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