

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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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) 1 min 36 s www	3	M1 for $1.2 \times 0.8 \times 0.5 (= 0.48)$ A1 1.6 or 96 If A0, B1 for correctly converting to min and sec Dep on M1
	(b) 0.954 to 0.956 www	3	M2 for $\frac{\text{their } 0.48}{\pi \times 0.4^2}$ or M1 for $\pi \times 0.4^2 \times d = '0.48'$
	(c) 8.09 to 8.10 www	4	M1 for $\pi \times 0.4^2 (0.503)$ condone $\times 2$ and M1 for $\pi \times 0.8 \times 1.2 (3.02)$ M1 for their area $\times 2.3$ (dep M1 M1)
2	(a) 0.5, 4	1+1	
	(b) 6 points plotted ft	P2	P1 for 5 points
	Correct shaped curve through 6 points (exponential)	C1	Ignore to left of $x = -2$
	(c) (i) Correct ruled line reaching both points	L1	
	(ii) $6 \div 3$ oe	1	Allow 'test' with a coordinate on the line (not 0, 2)
	(iii) -0.8 to -0.6	1	Dep on L1
	(d) Tangent drawn at (1, 2) Rise/run attempt using correct scales 1.2 to 1.6 cao	T1 M1 A1	Not chord, allow up to 1 mm daylight Dep on T1
3	(a) (i) 50 www3	3	B1 for angle ADB or $ABD = 70$ B1 for angle $DBC = 80$
	(ii) Angle $DCB \neq$ angle CBE oe	1	Accept angle $CDB \neq$ angle ABD
	(b) 12	B3	M2 for $\frac{5n}{2} = \frac{360}{n}$ oe or M1 for 360 soi
	(c) 65 www	3	$OAC = 25$, $CAB = 25$, $OBA = 50$, $BOC = 50$, $AOB = 80$, $AOC = 130$ B1 each, max 2

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4	(a) Image (1, -1), (1, -2), (4, -2), (3, -1)	2	B1 if vertices plotted only or reflects in $y =$
	(b) Image (-3, 2), (-4, 2), (-4, 5), (-3, 4)	2	B1 for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
	(c) (i) Rotation only, 90 clockwise oe, (Centre) (0, 0) oe	1 1 1	Spoilt if extras
	(ii) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	2	B1 for one row or one column correct
	(d) Stretch only, (Factor) 2, x-axis oe invariant	1 1 1	Spoilt if extras
5	(a) 55 www	B4	M3 for $3w + 6(w + 5) = 525$ oe in \$ or $(3j - 5) + 6j = 525$ oe in \$ or M2 for $j = w + \text{figs}5$ oe and $3w + 6j = \text{figs}525$ or M1 for w and $w + \text{figs}5$ or j and $j - \text{figs}5$
	(b) (i) $\frac{72}{x} - \frac{72}{x+3} = 2$ oe $72(x+3) - 72x = 2x(x+3)$ oe	M2 M1	M1 for $\frac{72}{x}$ or $\frac{72}{x+3}$ Dep on 3 terms above Fractions removed, isw
	(ii) -12, 9 www	3	M2 for $(x+12)(x-9)$ or $\frac{-3 \pm \sqrt{441}}{2}$ or SC1 for $(x+a)(x+b)$ where $ab = -108$ or $a+b = 3$ or $\frac{-3 \pm \sqrt{3^2 - 4 \times 1 \times -108}}{2}$
	(iii) 30	1	ft $3 \times \text{a positive root} + 3$
6	(a) (i) 13 or 13.0 www	3	M1 for $3^2 + 4^2$ oe Equiv if find AC first and M1 for $\sqrt{12^2 + \text{their}(3^2 + 4^2)}$
	(ii) 13.32 to 13.35 or 13.3	2	M1 for $\sin = \frac{3}{\text{their } AP}$ or $\tan = \frac{3}{\text{their } AC}$ oe
	(b) (i) 36.86 to 36.87 or 36.9	2	M1 for $\tan(PBC) = \frac{3}{4}$ oe
	(ii) 2.770 to 2.774 or 2.77	3	M2 for $\frac{4 \sin \text{their (b)(i)}}{\sin 120}$ or M1 for correct implicit eqn

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7	<p>(a) $3 < t \leq 4$</p> <p>(b) 1 2.5 3.5 6 $\sum fx$ with x in correct interval $662 \div 200$ 3.31 cso</p> <p>(c) (i) 92, 164 (ii) (2, 24), (3, 92), (4, 164), (8, 200) ft Curve/polygon through the 4 points (iii) $3 \leq \text{med} \leq 3.2$ $2.4 \leq \text{lq} \leq 2.7$ $0.9 \leq \text{iqr} \leq 1.5$</p>	<p>1 M1 M1 M1 A1 1 P2ft 1ft B1 B1 B1</p>	<p>Condone alt. notation used for class Mid-interval values soi Allow 1 slip (24 170 252 216) M1 dep on second M1 P1ft for 3 points ft increasing curve/polygon</p>
8	<p>(a) 243</p> <p>(b) $\frac{1-x}{2}$ or $\frac{x-1}{-2}$ final ans</p> <p>(c) $\frac{-1 \pm \sqrt{1^2 - 4(1)(-1)}}{2(1)}$ -1.62, 0.62</p> <p>(d) $4x^2 - 6x + 1$ final ans www3</p> <p>(e) 9</p>	<p>2 2 B2 B1B1 3 1</p>	<p>B1 for $(g(-2) =) 5$ seen or $3^{(1-2x)}$ M1 for $x = 1 - 2y$ or $x = (1 - y)/2$ B1 for $\sqrt{1^2 - 4(1)(-1)}$ or better $(\sqrt{5})$ seen anywhere If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ B1 for $p = -1$ and $r = 2(1)$ SC1 for -1.62 and 0.62 seen or -1.6 or -1.618.. and 0.6 or 0.618... M1 for $(1 - 2x)^2 + (1 - 2x) - 1$ or better and B1 for $(1 - 2x)^2 = 1 - 2x - 2x + 4x^2$ or better</p>

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9	<p>(a) (i) $\frac{1}{4}$ oe</p> <p>(ii) 25 cao</p> <p>(b) $\frac{2}{12}$ oe cao</p> <p>(c) $\frac{7}{20}$ oe cao</p> <p>(d) $\frac{6}{60}$ oe cao</p>	<p>1</p> <p>1ft</p> <p>2</p> <p>3</p> <p>2</p>	<p>Accept fraction, %, dec equivalents (3sf or better when not exact) throughout but not ratio or words isw incorrect cancelling/conversion to other forms</p> <p>ft their $\frac{1}{4} \times 100$ to 3sf or better or rounding or truncating to integer Not 25/100</p> <p>M1 for $\frac{2}{4} \times \frac{1}{3}$ 0.167, 16.7%</p> <p>M2 for $\frac{1}{4} \times \frac{4}{5} + \frac{3}{4} \times \frac{1}{5}$ or M1 for $\frac{1}{4} \times \frac{4}{5}$ or $\frac{3}{4} \times \frac{1}{5}$ After 0, SC1 for 7 correct in list (condone UU in addition)</p> <p>M1 for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} \times \left(\frac{2}{2}\right)$</p>
10	<p>(a) $20x + 10y \geq 200$</p> <p>(b) $x + y \leq 15, y \geq 3, y \leq x$</p> <p>(c)</p> <p>$2x + y = 20$ ruled</p> <p>$x + y = 15$ ruled</p> <p>$y = x$ ruled</p> <p>$y = 3$ ruled</p> <p>Quadrilateral identified</p> <p>(d) (i) 47 cao</p> <p>(ii) 7, 6 cao</p>	<p>1</p> <p>3</p> <p>B2</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>R1</p> <p>1</p> <p>2</p>	<p>In (a), (b) –1 once for wrong symbol</p> <p>B1 for each</p> <p>All lines long enough to make full boundary of region, accept dashed or solid lines, 2 mm acc at intercepts</p> <p>B1 for ruled line through (10, 0) or (0, 20)</p> <p>–1 once, freehand</p> <p>Allow if slight inaccuracy(s) in diagonal lines Allow any clear indication of region</p> <p>M1 for any $5x + 2y$ in their region evaluated to equal their 47</p>

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11	(a) (i) $\begin{pmatrix} 8 \\ 1 \end{pmatrix}$	1	
	(ii) Point (3, 4) indicated	1	
	(iii) $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$	1	
	(b) (i) $-\frac{5}{12}\mathbf{u} + \frac{2}{3}\mathbf{v}$ oe 2 terms	4	M1 for any correct route L to K e.g. $LU + UK$ and B1 for $LU = \mathbf{u}/4$ oe or $OL = \frac{3}{4}\mathbf{u}$ oe and B1 for $UK = \frac{2}{3}(\mathbf{v} - \mathbf{u})$ oe or $VK = \frac{1}{3}(\mathbf{u} - \mathbf{v})$ oe all Bs are soi
	(ii) $\frac{13}{24}\mathbf{u} + \frac{1}{3}\mathbf{v}$ oe 2 terms	2	M1 for correct route from O to M e.g. $OL + LM$ (can be in terms of \mathbf{u}, \mathbf{v})
12	(a) (i) 12, ..., 30	2	B1 each
	(ii) $(n + 1)(n + 2)$ oe	1	isw if expand incorrectly
	(iii) $p = 2$	1	
	$q = 2$	1	
	(iv) 69(th), 70(th)	2	M1 for their $2n + 2 = 140$ soi
	(b) (i) $2 \times 3 + 7$	1	Accept $2 \times 3 + 2 \times 2 + 3$
	(ii) 27	1	
	(iii) 1707, ..., 13 653	1,1	