

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/42

Paper 4 (Extended), maximum raw mark 130

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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)	$\frac{6}{5+6+3} \times 560$ [= 240]	2	Accept 'of' used instead of \times M1 for $560 \div (5 + 6 + 3)$
	(ii)	120	1	
	(b)	90	2	M1 for $\frac{3}{8} \times 240$ oe
	(c) (i)	96120 final answer	2	M1 for <i>their(a)(ii)</i> $\times 75 + (560 - \textit{their (a)(ii)}) \times 198$ oe
	(ii)	187.5[0] final answer	3	M2 for $\frac{198}{1+0.056}$ oe or M1 for $(100 + 5.6)[\%] = 198$ oe seen
	(d)	184[.2....]	3	M2 for $\frac{36 \times 0.75 - 9.5}{9.5} \times 100$ oe or M1 for $\frac{36 \times 0.75}{9.5} \times 100$ or $36 \times 0.75 - 9.5$ [17.5] used implied by answer 84.2 or SC1 for final answer 284[.2..]
	(e)	69.4 and 69[.0] cao	3	SC2 for one correct or both correct but reversed M1 for two of 10.85, 10.95, 23.65 or 23.75 seen or $2(23.7 + 10.9) + 4(0.05)$ or $2(23.7 + 10.9) - 4(0.05)$

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2	(a) (i)	Translation, $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ oe	1,1	Brackets needed for vector Not $(-5, 8)$, $(-5 \ 8)$
	(ii)	correct trapezium at $(2, 2)$ $(4, 3)$ $(4, 5)$ $(2, 5)$	2	SC1 for reflection in $x = -1$ or vertices only
	(iii)	correct trapezium at $(4, 2)$ $(5, 4)$ $(7, 4)$ $(7, 2)$	3	M2 for 4 correct vertices on grid or in working or M1 for $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 2 & 4 & 4 \\ -4 & -7 & -7 & -5 \end{pmatrix}$ or SC1 for 3 vertices correct or complete shape in correct orientation but wrong position
	(b) (i)	Shear x -axis (oe) invariant 2	1 1 1	
	(ii)	rectangle at $(-3, 2)$ $(1, 2)$ $(1, 8)$ $(-3, 8)$	2	SC1 for all vertices only or correct orientation and size, wrong position
3	(a)	0, 2, 0, -3	3	B2 for 3 correct or B1 for 2 correct
	(b)	Correct curve	B4	B3FT for 8 points B2FT for 7 or 6 points B1FT for 5 or 4 points
	(c)	$y = -1$ indicated $x = 1.3$ to 1.4 and 4.1 to 4.2	B1 B1	e.g. Could be mark[s] on curve isw other lines if not clearly used
	(d) (i)	line drawn from $(0, 2)$ to touch curve $(2.5$ to $2.75, 3$ to $3.4)$	M1 A1	No daylight at point of contact If short, must cross at $(0, 2)$ within $\frac{1}{2}$ small square when extended
	(ii)	rise/run e.g. $(\text{their } y - 2)/\text{their } x$ 0.4 to 0.48	M1 A1	dep on attempt at a tangent from $(0, 2)$ in (d)(i) and uses scales correctly Can be implied from answer– check on tangent for their rise for a run of 1 ($\frac{1}{2}$ small square) ww2 dep on attempt at a tangent from $(0, 2)$ in (d)(i)

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4	(a)	227 or 226.95 to 227.01	2	M1 for $\pi \times 8.5^2$
	(b)	5.35	1	
	(c)	39.0[0] to 39.0[1]	2	M1 for $\sin [MOB] = \frac{\text{their } b}{8.5}$ oe Dep on their $b < 8.5$
	(d)	30.2 or 30.3 or 30.24 to 30.27	3	M2 for $\frac{360 - 4 \times 39}{360} \times 2 \times \pi \times 8.5$ oe or M1 for $\frac{a}{360} \times 2 \times \pi \times 8.5$ oe where $0 < a < 360$ Implied by 5.78 to 5.79 or 11.5 to 11.6 or 23.14 to 23.15 or 23.1 or 23.2 or 41.83 to 41.84 or 41.8
	(e)	$AB = BC$ $TA = TC$ $TB = TB$	1 1 1	isw comments or reasons If 0 scored SC1 for “all <u>three sides</u> the same” oe [SSS] and no mention of angles
5	(a)	$\frac{27}{x}$ final answer	1	
	(b)	$\frac{25}{x-2}$ final answer	1	
	(c)	$\frac{25}{x-2} - 4 = \frac{27}{x}$ oe $25x - 4x(x-2) = 27(x-2)$ oe $4x^2 + 27x - 25x - 8x - 54 [= 0]$ oe $2x^2 - 3x - 27 = 0$ without error seen	M1 M1 M1dep A1	FT $\text{their } (b) - 4 = \text{their } (a)$ oe must be eqn in x FT $\frac{25}{x-2} + 4 = \frac{27}{x}$ oe <u>only</u> for 2 nd and 3 rd M mark If all on one side then condone omission of ‘= 0’ Dep on 2 nd M1 Must see brackets expanded before this award and terms on one side of eqn Must see $4x^2 - 6x - 54 = 0$ first
	(d)	-3, 4.5	3	B2 for $(2x-9)(x+3)$ or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = -3$ or $ab = -27$
	(e)	6 cao	1	

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6	(a) (i)	$\frac{12^2 + 21^2 - 15^2}{2 \times 12 \times 21}$ 44.41 to 44.42	M2	M1 for $15^2 = 12^2 + 21^2 - 2.12.21\cos M$
	(ii)	88.2 or 88.15 to 88.19	A2	A1 for [cos =] 0.714 or 0.7142 to 0.7143 or $\frac{360}{504}$ oe
	(b)	7.74 or 7.736 to 7.737.... www	2	M1 for $0.5 \times 12 \times 21 \times \sin(44.4)$ oe
			4	B1 for 55 soi M2 $\frac{6.4}{\sin(\text{their } R)} \times \sin 82$ oe or M1 for $\frac{6.4}{\sin(\text{their } R)} = \frac{PR}{\sin 82}$ oe
7	(a) (i)	$\begin{pmatrix} 15 \\ 21 \end{pmatrix}$	1	
	(ii)	not possible oe	1	
	(iii)	(2) final answer	2	M1 for 30 – 28
	(iv)	$\begin{pmatrix} 4 & 13 \\ 0 & 0 \end{pmatrix}$	1	
	(v)	$\begin{pmatrix} -5 & -9 \\ 1 & 0 \end{pmatrix}$	2	B1 for one correct row or column
	(b)	$\frac{1}{2} \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ or better isw	2	B1 for $k \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ seen or implied or $\frac{1}{2} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen
8	(a)	hat $\frac{5}{8}, \frac{3}{8}$ scarf $\frac{2}{3}, \frac{1}{3}$ $\frac{1}{6}, \frac{5}{6}$	1 1 1	1 mark per pair in correct place
	(b) (i)	$\frac{15}{48}$ oe $\left[\frac{5}{16} \right]$	2FT	FT their $\frac{3}{8} \times \frac{5}{6}$ correctly evaluated M1 $\frac{3}{8} \times \frac{5}{6}$ FT from their tree
	(ii)	$\frac{5}{24}$	2FT	FT their $\frac{5}{8} \times \frac{1}{3}$ correctly evaluated M1 $\frac{5}{8} \times \frac{1}{3}$ FT from their tree

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(iii)	$\frac{13}{48}$ cao	2	M1 for <i>their</i> $\frac{3}{8} \times \frac{1}{6} + \text{their (b)(ii) soi}$
(c)	$\frac{170}{240}$ or $\frac{85}{120}$ or $\frac{34}{48}$ or $\frac{17}{24}$ cao	3	M2 for $1 - \frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree</i> or $\frac{3}{8} + \frac{5}{8} \times \frac{1}{3} + \frac{5}{8} \times \frac{2}{3} \times \frac{3}{10}$ oe or M1 for [“wears all” =] $\frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree</i> seen
9 (a)	371 or 371.1...	4	M3 for $(6 \times 4 \times 12) + (2 \times 6 \times 0.5 \times 4 \times 4 \times \sin 60)$ oe or M2 for area of 1 or 2 hexagons or M1 for area of one relevant triangle or trapezium or rectangle within hexagon If 0 scored SC1 for 288 shown
(b) (i)	1740 or 1743.6 to 1744.2	4	M3 for $\frac{12000}{4} \div (\pi \times 0.74^2)$ oe or SC2 for figs 174[3..] or 174[4..] or B1 for $\pi \times 0.74^2$ seen [1.72..] or B1 for 12000 / 4 soi by 3000
(ii)	87 cao www 5	5	B4 for 87.39 to 87.43 or M3 for [r=] $\sqrt{\frac{\text{figs } 12}{\pi \times \text{figs } 5}}$ oe or M2 for [r ² =] = $\frac{\text{figs } 12}{\pi \text{ figs } 5}$ oe or M1 for figs 12 = $\pi r^2 \times \text{figs } 5$
10 (a) (i)	final answer $\frac{25-8x}{20}$	2	M1 for $\frac{5 \times 5 - 4 \times 2x}{5 \times 4}$ or better seen
(ii)	final answer $\frac{2x^2 + 5x + 9}{3(x+3)}$	3	B1 for $2x^2 + 6x - x - 3$ soi and B1 for denom $3(x+3)$ or $3x+9$ seen
(b)	$x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 $y = -3$	3	M1 for correct method to eliminate one variable A1 for $x = \frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 or $y = -3$

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(c)	final answer $\frac{7}{2x+3}$ www	4	<p>B1 for $7(x+3)$ in numerator and B2 for $(2x+3)(x+3)$ in denominator or SC1 for $(2x+a)(x+b)$ where a and b are integers and $a+2b=9$ or $ab=9$</p> <p>After B1 scored, SC1 for final answer $\frac{7}{2(x+1.5)}$ or $\frac{3.5}{x+1.5}$</p>
11 (a)	$3^2 + 1^2$	1	Ignore attempt to evaluate $\sqrt{10}$
(b) (i)	$\frac{\sqrt{10}}{3}$ final answer	1	
(ii)	$\frac{10}{3}$ final answer	2	<p>M1 for <i>their</i> $\frac{\sqrt{10}}{3} \times \sqrt{10}$ or <i>their</i> $\left(\frac{\sqrt{10}}{3}\right)^2 + (\sqrt{10})^2$ implied by 3.33 seen</p>
(c)	$\frac{100}{27}$ or $3\frac{19}{27}$ isw conversion or 3.7[03] to 3.7[04]	2	<p>M1 for $3 \times \left(\frac{\sqrt{10}}{3}\right)^n$ oe where n is 3 or 4 or for $[OP_4 =] \sqrt{\frac{1000}{81}}$ or for <i>their</i> (b)(ii) $\times \left(\frac{\sqrt{10}}{3}\right)^n$ where n is 1 or 2</p>
(d) (i)	18.43...	2	M1 for $\tan [P_1OP_2] = \frac{1}{3}$ oe
(ii)	18.4[3...]	1	
(iii)	20	3	<p>SC2 for 19 or M1 for $\frac{360}{18.4[3...]}$</p>