

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/42

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) (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 their (b) - 4 = 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

	(iii)	$\frac{13}{48}$ cao	2	M1 for <i>their</i> $\frac{3}{8} \times \frac{1}{6}$ + <i>their</i> (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</i> tree 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</i> tree 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>