CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0580 MATHEMATICS

0580/42   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.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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)**	$\dfrac{6}{5+6+3}\times 560$ [= 240]	**2**	Accept 'of' used instead of × **M1** for $560 \div (5 + 6 + 3)$
		(ii)	120	**1**	
	(b)		90	**2**	**M1** for $\dfrac{3}{8}\times 240$ oe
	(c)	**(i)**	96120 final answer	**2**	**M1** for *their*(a)(ii) × 75 + (560 − *their* (a)(ii)) × 198 oe
		(ii)	187.5[0] final answer	**3**	**M2** for $\dfrac{198}{1+0.056}$ oe or **M1** for (100 + 5.6)[%] = 198 oe seen
	(d)		184[.2....]	**3**	**M2** for $\dfrac{36\times 0.75-9.5}{9.5}\times 100$ oe **or M1** for $\dfrac{36\times 0.75}{9.5}\times 100$ 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)

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	1	
			x –axis (oe) invariant	1	
			2	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	B1	e.g. Could be mark[s] on curve isw other lines if not clearly used
			x = 1.3 to 1.4 and 4.1 to 4.2	B1	
	(d)	(i)	line drawn from (0, 2) to touch curve	M1	No daylight at point of contact If short, must cross at (0, 2) within ½ small square when extended
			(2.5 to 2.75, 3 to 3.4)	A1	
		(ii)	rise/run e.g. (their y – 2)/their x	M1	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 (½ small square)
			0.4 to 0.48	A1	**ww2** dep on attempt at a tangent from (0, 2) in (d)(i)

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]= $\dfrac{their\ b}{8.5}$ oe Dep on their $b < 8.5$
	(d)	30.2 or 30.3 or 30.24 to 30.27	3	**M2** for $\dfrac{360 - 4 \times 39}{360} \times 2 \times \pi \times 8.5$ oe or **M1** for $\dfrac{a}{360} \times 2 \times \pi \times 8.5$ 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)	$\dfrac{27}{x}$ final answer	1	
	(b)	$\dfrac{25}{x-2}$ final answer	1	
	(c)	$\dfrac{25}{x-2} - 4 = \dfrac{27}{x}$ oe	**M1**	**FT** *their* (b) – 4 = *their* (a) oe must be eqn in x
		$25x - 4x(x-2) = 27(x-2)$ oe	**M1**	**FT** $\dfrac{25}{x-2} + 4 = \dfrac{27}{x}$ oe **<u>only</u>** for 2nd and 3rd M mark If all on one side then condone omission of '= 0'
		$4x^2 + 27x - 25x - 8x - 54[= 0]$ oe	**M1dep**	Dep on 2nd M1 Must see brackets expanded before this award and terms on one side of eqn
		$2x^2 - 3x - 27 = 0$ without error seen	**A1**	Must see $4x^2 - 6x - 54 = 0$ first
	(d)	$-3, \quad 4.5$	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	

© Cambridge International Examinations 2013

6	(a)	(i)	$\dfrac{12^2 + 21^2 - 15^2}{2 \times 12 \times 21}$ 44.41 to 44.42	M2 A2	M1 for $15^2 = 12^2 + 21^2 - 2.12.21\cos M$ A1 for [cos =] 0.714 or 0.7142 to 0.7143 or $\dfrac{360}{504}$ oe
		(ii)	88.2 or 88.15 to 88.19	2	M1 for $0.5 \times 12 \times 21 \times \sin(44.4)$ oe
	(b)		7.74 or 7.736 to 7.737…. www	4	B1 for 55 soi M2 $\dfrac{6.4}{\sin(their\,R)} \times \sin 82$ oe or M1 for $\dfrac{6.4}{\sin(their R)} = \dfrac{PR}{\sin 82}$ 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)		$\dfrac{1}{2}\begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ or better isw	2	B1 for $k\begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$ seen or implied or $\dfrac{1}{2}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ seen
8	(a)		hat $\dfrac{5}{8}$, $\dfrac{3}{8}$ scarf $\dfrac{2}{3}$ $\dfrac{1}{3}$ $\dfrac{1}{6}$ $\dfrac{5}{6}$	1 1 1	1 mark per pair in correct place
	(b)	(i)	$\dfrac{15}{48}$ oe $\qquad\qquad \left[\dfrac{5}{16}\right]$	2FT	FT *their* $\dfrac{3}{8} \times \dfrac{5}{6}$ correctly evaluated M1 $\dfrac{3}{8} \times \dfrac{5}{6}$ FT from *their* tree
		(ii)	$\dfrac{5}{24}$	2FT	FT *their* $\dfrac{5}{8} \times \dfrac{1}{3}$ correctly evaluated M1 $\dfrac{5}{8} \times \dfrac{1}{3}$ FT from *their* tree

(iii)	$\dfrac{13}{48}$ cao	**2**	**M1** for *their* $\dfrac{3}{8} \times \dfrac{1}{6}$ + *their* (b)(ii) soi	
(c)	$\dfrac{170}{240}$ or $\dfrac{85}{120}$ *or* $\dfrac{34}{48}$ *or* $\dfrac{17}{24}$ cao	**3**	**M2** for $1 - \dfrac{5}{8} \times \dfrac{2}{3} \times \dfrac{7}{10}$ FT *their* tree or $\dfrac{3}{8} + \dfrac{5}{8} \times \dfrac{1}{3} + \dfrac{5}{8} \times \dfrac{2}{3} \times \dfrac{3}{10}$ oe **or M1** for ["wears all" =] $\dfrac{5}{8} \times \dfrac{2}{3} \times \dfrac{7}{10}$ FT *their* 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 $\dfrac{12000}{4} \div (\pi \times 0.74^2)$ 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 $[r=] \sqrt{\dfrac{figs\,12}{\pi \times figs\,5}}$ oe or **M2** for $[r^2 =] = \dfrac{figs\,12}{\pi \, figs\,5}$ oe or **M1** for $figs\,12 = \pi r^2 \times figs\,5$	
10 **(a)** **(i)**	final answer $\dfrac{25 - 8x}{20}$	**2**	**M1** for $\dfrac{5 \times 5 - 4 \times 2x}{5 \times 4}$ or better seen	
(ii)	final answer $\dfrac{2x^2 + 5x + 9}{3(x + 3)}$	**3**	**B1** for $2x^2 + 6x - x - 3$ soi **and B1** for denom $3(x+3)$ or $3x + 9$ seen	
(b)	$x = \tfrac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 $y = -3$	**3**	**M1** for correct method to eliminate one variable **A1** for $x = \tfrac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667 or $y = -3$	

© Cambridge International Examinations 2013

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