

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

MARK SCHEME for the May/June 2012 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		
1 (a) 1134		3	M2 for $\frac{504}{12} \times (12 + 7 + 8)$ soi by answer of 1130 or B1 for 27 or 42 or 294 or 336 seen		
(b) (i)	468.72	3	M2 for $\frac{93}{100} \times 504$ oe soi by 468.7 or 469		
(ii)	84	3	or M1 for $\frac{7}{100} \times 504$ (implied by 35.28) M2 for $\frac{64.68}{77} \times 100$ or M1 for $(100 - 23)\% = 64.68$		
(c)	262.19 cao	3	M2 for 250×1.016^3 oe implied by answer 262.2 or better		
(d)	12.5%	3	or M1 for 250×1.016^n oe $n > 2$ seen M2 for $\frac{324 - 288}{288} \times 100$ or M1 for $\frac{324}{288} \times 100 (112.5)$ or $\frac{36}{288} (0.125)$		
2 (a)	10.9 or 10.92 www 4	4	M2 for $4^2 + 9^2 - 2 \times 4 \times 9 \times \cos 108$		
			If M0 , M1 for correct implicit statement		
(b) (i)	5.16 or 5.162 www 3	3	 A1 for 119.249(which can be 3 www) M2 for 9 × cos 55 oe in correct triangle If M0, B1 for 55 or 35 in correct position soi 		
(ii)	(0)53	B2	SC1 for answer 233		

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3	(a)	1 0.98	8(4) 0 - 0.98(4) - 1	B3	B2 for 4 correct, B1 for 3 correct		
	(b)	9 point	s plotted	P3ft	B2 for 7 or 8 points correct B1 for 5 or 6 points correct		
		smooth	curve	C 1	correct cubic shape through 8 or more points from -2 to 2		
	(c) (i)	<i>y</i> = 0.8	drawn	B1	Accept good freehand To make the three possible intersections (otherwise the line must be from -2 to 2)		
	(ii)	-1.1 to	-1.2, -0.4 to -0. 5, 1.55 to 1.65	1, 1, 1			
	(d)	correct 4 to 5.5	tangent drawn at $x = -1.5$	T1 B2	Allow slight daylight dep on T1 M1 for evidence rise/run with correct scales dep on T1		
4	(a)	90		B1			
	(b)	tan(AC) 34.9(9.	$(B) = 7 \div 10$ oe)	M1 A1	Any longer method must reach equivalent stage		
	(c)	same s	egment	B 1	Allow same arc oe		
	(d) (i)	11.9 or	11.8(9) www 3	3	M2 for $\frac{7 \times \sin 77}{\sin 35}$		
					or M1 for implicit form		
	(ii)	38.6 (3	8.58 to 38.62) www 2	2	M1 for $0.5 \times 7 \times their (d)(i) \times sin(180 - 77 - 35)$ oe		
					Allow 68.00 to 68.01 for 68		
	(e)	8.69 or www 3	8.7(0) or 8.685 to 8.700 cao	3	M2 for $12.3 \times \left(\frac{10}{their \ 11.9}\right)^2$		
					or M1 for $\left(\frac{10}{their \ 11.9}\right)^2$ or reciprocal seen		
5	(a) (i)	2.8 cao		1	accept 2 (h) 48, not 2.48		
	(ii)	3.8 cao		1	accept 3 (h) 48 not 3.48		
	(iii)	1.8 cao		1ft	ft their (a)(ii) -2 accept 1 (h) 48 and 1.48		
	(b)	6		1			
	(c) (i)	9, 4, 4		2	B1 for 2 correct		

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(ii)	1 2.5	3.5 4.5 5.5 7	M1	At least 5 co	At least 5 correct mid-values seen		
		$1 + 25 \times 2.5 + 18 \times 3.5 + $ $\times 4.5 + their 4 \times 5.5 + their 4 \times $	M1		e x is in the correct		
	7 (= 236			(20+62.5+63+40.5+22+28)		28)	
	÷ 80		M1	Dependent o	n second method r	nark	
	2.95 ca	10	A1	Allow www	4		
(d)	horizo	uitably numbered or ntal axis suitably numbered and ale stated	1	e.g. $4cm^2 = 1$	10		
	6 colu	nns with correct relative widths	1	no gaps, but	condone reasonab	le freehand	
	heights	s: 10 25, 18, <i>their</i> 9, <i>their</i> 4 <i>their</i> 4 ÷ 2	1 1 1	if vertical axis not labelled use correct relative heights			
6 (a) (i)	(4x - 2)	7)(2x-1) = 1	M1	or $(4x - 7)($	(2x-1) - 1 = 0 only	у	
	$8x^2 - $	14x - 4x + 7	B 1	allow $-18x$	and/or $+6=0$ or	+6=0 or $=-6$	
	$4x^2 - 2$	14x - 4x + 7 $9x + 3 = 0$	E1	with no errors or omissions seen			
(ii)	(<i>x</i> =) -	$\frac{-(-9) \pm \sqrt{(-9)^2 - 4(4)(3)}}{2 \times 4}$	B2				
				in the form -	_		
	(<i>x</i> =)	0.41, 1.84 cao	B1,B1	After B0B0, SC1 for 0.4 or 0.406(929) and 1.8 or 1.843(070)		06(929)	
(iii)	0.36 o	r 0.3720 to 0.3724 or 0.37	B1ft	ft their value to give positive $(4x - 7)$		4 <i>x</i> – 7)	
(b) (i)	(x - 4)	(x + 4)	B 1	fractions cleared or could all still be over (x or			
(ii)	(2x+3) oe	$3)(x+4) + (x+40) = 2(x^2 - 16)$	M2			ill be over $(x^2 - 16)$	
				$(2x+3)(x^2-16) + (x+40)(x-4) = 2(x-4)$		$(-4) = 2(x-4)(x^2 - 16)$	
	$2x^2 + 2x^3 + 3$	8x + 3x + 12 or $3x^2 - 32x - 48$	B1	Condone sign slips			
	x = -7	www 4	A1				

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7		In any part of part (a) all marks are independent but mention of a second transformation scores 0 out of 3					
	(a) (i)	Rotation (centre/about) origin (<i>O</i>) (0,0) 180°	1 1 1	accept R SC3 for all of enlargement, sf -1 , (0, 0)			
	(ii)	Enlargement (centre/about) (0,- 3) SF - 3	1 1 1	accept E			
	(iii)	Enlargement (centre/about) (0, 6) SF $\frac{1}{3}$	1 1 1	accept E			
	(b) (i)	image at (-4, -2) (-2, -2) and (-1, 0)	2	SC1 for translation by $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$, $k \neq 0$			
	(ii)	image at (-2, 3) (-4, 3) and (-5, 5)	2	SC1 for reflection in $y = -1$			
	(c) (i)	image at (0, 3) (4, 3) and (6, 5)	2	SC1 for stretch sf 2 with x-axis invariant ie at $(0,6)$ $(2,6)$ $(3,10)$			
	(ii)	$\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} ft$	2 ft	ft their stretch factor only			
		$\begin{pmatrix} 0 & 1 \end{pmatrix}$		SC1 for correct left hand column ft or $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ ft			
8	(a)	2 4 6 8	1				
	(b)	3	1				
	(c) (i)	(x-4)(x-9)	2	SC1 any other $(x + a)(x + b)$ where $a \times b = 36$ or $a + b = -13$			
	(ii)	4 9	B1 ft	ft or can recover			
	(d) g						
		E 8 5 F	2	Must have all 9 numbers on diagram and no extras			
		$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		SC1 for 5 or more correct elements			
	(e) (i)	\varnothing or { } cao	1				
	(ii)	∉ cao	1				
	(iii)	\cup cao	1				

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9 (a) (i)	14		1			
(ii)	13 - 2x		2	M1 for $7-2(x-3)$ M1 for $2x = 7-y$, $x = \frac{7-y}{2}$ oe or $x = 7-2y$, $2y = 7-x$ oe i.e one step from answer		
(iii)	$25x^2$ -	-8 final answer	1			
(b)	$\frac{7-x}{2}$	oe	2			
(c)	$9x^{2} +$	30x + 17	3	M1 for $(3x)$ B1 for $9x^2$ -	$(+5)^2 - 8$ seen $(+30x + 25)^2 - 8$	
(d)	7 cao		3	M2 for $3(3x + 5) + 5 = 83$ or better or B1 for $3(3x + 5) + 5$ oe M1 for $2(3x + 5) < 7 - 2x$ oe B1 for $8x^* - 3$ or $-8x^* 3$ Do not accept $\frac{3}{-8}$		
(e)	<i>x</i> <	$\frac{3}{8}$ oe cao	3			
10 (a)	2030 c	r 2040 or 2034 to 2036. ()	2	$(V=)\frac{1}{3} \times \pi \times 9^2 \times 24$		
				Accept 648π	for 2 marks if final	answer
(b)	(upper	radius =) 3	B 1	accept $9 \times -\frac{1}{2}$	$\frac{8}{24}$ oe	
	(vol cu	tt off =) $\frac{1}{3} \times \pi \times their 3^2 \times 8$	M1	(= 75.36 to 7	(5.41) their r must b	e less than 9
	their (a	a) – <i>their</i> 75.39	M1 dep	[alternate m	sides 1:3 ols 1 : 27 × 26 ÷ 27]	
	1958 t	o 1964.()	E1			
(c)	1960 =	$5 \times \pi \times r^2 \times 15$ soi	M1			
	$r^2 = 1$	$960 \div \pi \div 15 \div 5$ 8.318	M1	I1 dep on M1 M1		
	√ their	8.318	M1			1000
	2.88 to	2.89	E1	SC2 for 5×7	$\tau \times 2.9^2 \times 15 = 1980$	to 1982