

MARK SCHEME for the May/June 2013 series

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/42

Paper 4 (Extended), maximum raw mark 120

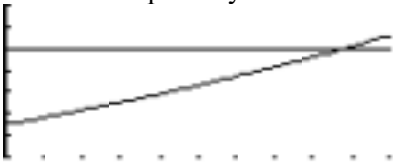
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, 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.

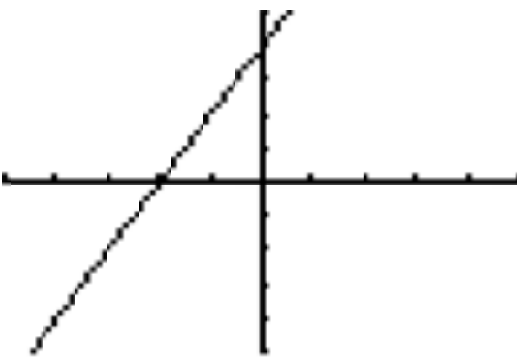
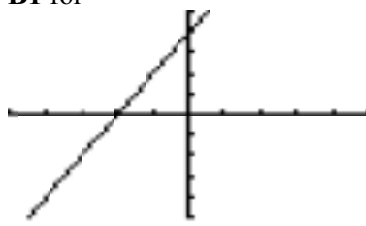
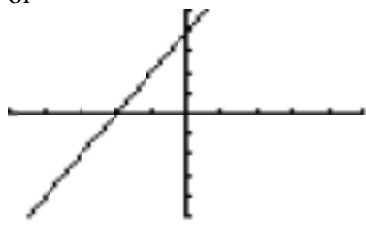
Cambridge will not enter into discussions about these mark schemes.

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.

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1 (a) (i) 27.2 (27.22...) (ii) 49 : 45 final answer (iii) 500 (iv) 748.8[0] cao final answer (b) 9 or 8.83 (8.829 to 8.830)		1 2 3 2 3	SC1 for answer 45:49 or 1.09 (1.088 to 1.089) or B1 for 180 seen (may be implied by their ratio answer) or 27.2 (27.22..) : 25 o.e. M2 for $720 \div 1.44$ o.e. or M1 for $720 = 144\%$ seen M1 for 720×1.04 o.e. implied by 749. $\div 12$ does not spoil method SC2 for answer 8.85 M2 for $\log(1000/650) \div \log(1.05)$ Allow 1.54 for $1000/650$ in methods. or M1 for $650 \times 1.05^n = 1000$ or 650 multiplied by 1.05 at least twice correctly  M2 for graphs that intersect as shown or M1 for graph of $y = 1.05^x$
2 (a) 7 (b) $\frac{2y}{y+1} = \frac{1}{3}$ $3 \times 2y = y + 1$ o.e. or better $\frac{1}{5}$ o.e.		M2 B2 M1 B1 B1	If M0, B1 for $2x(2x+1)$ or $3x(x+3)$ Condone missing brackets if correct expansions follow B1 for $x^2 = 7x$ o.e. or $2(2x+1) = 3(x+3)$ o.e. or final answer 0, 7 i.e correct equation without fractions leading to $y = \frac{1}{5}$

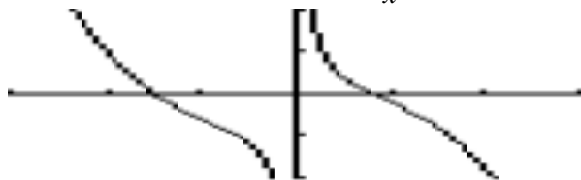
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(c) (i)	$\frac{10}{w} \text{ soi}$ $\frac{10}{w+9} \text{ soi}$ $2 \times 10(w+9) - 2 \times 10w = 5w(w+9) \text{ o.e. or better}$ or $\frac{90}{w(w+9)} = 2\frac{1}{2} \text{ o.e.}$ $w^2 + 9w - 36 = 0$	B1 B1 M1 E1 4	If not seen only implied by further working. e.g. $w \times 10 = 10$ is not sufficient. i.e. correct multiplication of an equation in the correct format allow $10(w+9) - 10w = 2.5w(w+9)$ o.e. also allow over common denominator i.e. correct collection of two terms Established with at least one more intermediate line with no errors or omissions B3 for $w = 3$ or for $w = 3$ or -12 www M2 for $(w+12)(w-3)$ or good sketch of quadratic showing zeros or quadratic formula or completing square reaching $\frac{-9 \pm \sqrt{225}}{2}$ or M1 for $(w+a)(w+b)$ with $ab = -36$ or $a+b = 9$ or sketch of quadratic or correct substitutions in quadratic formula before simplifying or $(w+\frac{9}{2})^2 - \frac{81}{4} = 36$ o.e. Trial and improvement – allow M2 for at least 3 trials for comparison of distances and times (unless correct answer found with 1 or 2 trials) B1 FT for $10 \div \text{their positive root}$ correctly into hours and minutes
3 (a) (b) (i) (ii)	$y = -x - 1$ o.e. final answer Ruled line through $(-2, 0)$ and $(0, 4)$ 	2 2 2FT	B1 for $y = -x + c$ o.e. or $y = kx - 1$ o.e. seen B1 for ruled line through $(0, 4)$ or gradient of 2 B1 for  or  or tiny part not shaded FT only if positive gradient and cuts x-axis SC1 for correct area unshaded

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(c)	$y = 3x - 7$ o.e.	3	B2 for $y = 3x + c$ o.e. or $y = kx - 7$ o.e. or M1 for rise/run = $\frac{2-4}{3-1}$ o.e. and M1 for correct method for finding c Answer $3x - 7$ implies M1 M1
4 (a)	125.7 or 126	2	M1 if at least 2 mid-values seen (60, 125 and 195) or 2 from 1680, 5625, 5265 or sum of 12570
(b)	Columns from 100 to 150 and 150 to 240 Heights 0.9 and 0.3	1 1,1	Accept freehand
5 (a)	534.6... www 3	3	M1 for $988^2 + 1060^2 - 2 \times 988 \times 1060 \cos 30$ A1 for 285800 to 285802 or 286000
(b)	$[\cos =] \frac{1185^2 + 998^2 - 535^2}{2 \times 1185 \times 998}$ 26.6 (26.62 to 26.65)	M2 A1	Allow use of 534.6... for 535 M1 for correct implicit statement Strictly dependent on at least M1 SC2 if correct without working
(c)	353 (353.3 to 353.4)	1FT	FT 380 – <i>their</i> (b) only if answer between 270 and 360.
6 (a)	720	2	M1 for $0.5 \times 12 \times 6 \times 20$ o.e.
(b) (i)	700 (700.2 to 700.4)	4	Allow $432 + 120\sqrt{5}$ as final answer for full marks M1 for $[BC^2] = 12^2 + 6^2$ M2 for $BC \times 20 + 12 \times 20 + 6 \times 20 + 2 \times \text{area triangle } ABC$ or M1 if one of the five areas missing or is incorrect
(ii)	3.5[0] (3.501 to 3.502)	1FT	FT <i>their</i> (i) $\times 0.005$
(c)	14.4 (14.42 to 14.43)	3	M1 for $20^2 + 12^2$ (544) or $20^2 + 12^2 + 6^2$ (580) (Square roots 23.323..., 24.08...) M1 for $\tan = \frac{6}{\text{their} \sqrt{20^2 + 12^2}}$ or $\sin = \frac{6}{\text{their} \sqrt{20^2 + 12^2 + 6^2}}$ or $\cos = \frac{\text{their} \sqrt{20^2 + 12^2}}{\text{their} \sqrt{20^2 + 12^2 + 6^2}}$ o.e.

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7 (a)	[0]6 30 o.e., [Feb] 9th	3	B1 for [Feb] 9th. B2 for [0]6 30 o.e. or M1 for $27\frac{1}{2} + 13$ soi or B1 for 17 30 or 03 00 seen
(b)	669 (669.0 to 669.1)	1	
(c) (i)	7524 cao final answer	1	
(ii)	0.41	2FT	FT <i>their</i> (d)(i) $\div 18400$ B1FT for 0.409 or 0.4089...i.e not 2 dp
8 (a)	 – 1.49 (– 1.496 to – 1.494) 0.798 (0.7976...)	B2 B1 B1	B1 for poor quality sketch Sketch could be with different window. or a different function e.g. $y = \frac{2}{x} - x^3 - 2$ 
(b)	$x \leq -1.49$ or -1.496 to -1.494 $x > 0$ $x \leq 0.798$ or $0.7976...$	1FT 1 1FT	Condone $<$ for $\leq$ etc FT <i>their</i> (a) if one negative root FT <i>their</i> (a) if one positive root [14]
9 (a)	9.18 (9.177...)	3	M2 for $2 \times 8 \times \sin 35$ o.e. e.g. $\sqrt{8^2 + 8^2 - 2 \cdot 8 \cdot 8 \cos 70}$ ($\sqrt{84.22...}$) $\frac{AB}{8}$ or M1 for $\frac{2}{8} = \sin 35$ o.e. or above expression without square root
(b)	9.77 or 9.78 (9.773 to 9.775...)	2	M1 for $\frac{70}{360} \times \pi \times 16$ o.e. Allow $\frac{28\pi}{9}$ o.e. as final answer but must be exact
(c)	9.02 to 9.03 www 4	4	M3 for $\frac{70}{360} \times \pi \times 8 - 0.5 \times 8 \times 8 \sin 70$ o.e. or M1 for $\frac{70}{360} \times \pi \times 8$ and M1 for $0.5 \times 8 \times 8 \sin 70$ o.e. (39.09 to 39.10...) (30.1 or 30.07.....)

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10 (a) (i) (ii)		2	B1 for inaccurate sketch of $\cos x$
		2	B1 for inaccurate sketch of $2\sin(\frac{x}{2})$
	(b) $x = 180$	1	Condone π for 180
	(c) $(180, -1)$	1,1	Condone π for 180
	(d) $\frac{720}{2}$	1 1	Condone 4π for 720
	(e) (i) $0 \leq g(x) \leq 2$	1	Condone strict inequalities, allow x or y for $g(x)$ and allow separate inequalities in parts (i) and (ii)
	(ii) $-2 \leq g(x) \leq 2$	1	
	(f) 42.9 (42.94...), 317 (317.0 to 317.1)	1,1	
(g)	Correct area shaded.	1	
11 (a) (i)	$\frac{4}{6}$ o.e.	1	For all parts accept decimals or percentages with the usual rules for 3 sf. Do not penalise incorrect cancelling or converting. Do not accept ratios or words.
(ii)	$\frac{2}{6}$ o.e.	1	SC1 for 0.33 if no fraction seen
(iii)	1 o.e.	1	
(b) (i)	$\frac{5}{6}$, $\frac{1}{6}$ and $\frac{5}{6}$, $\frac{1}{6}$ and $\frac{5}{6}$	2	B1 for any one of the $\frac{5}{6}$ in a correct position
(ii)	$\frac{1}{36}$ cao	2	M1 for <i>their</i> $\frac{1}{6} \times \text{their } \frac{1}{6}$ (0.0278 or $0.02\overline{7}$ or 0.02777 to 0.02778)

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(iii)	$\frac{11}{36}$ cao	2	M1 for $1 - \text{their } \frac{5}{6} \times \text{their } \frac{5}{6}$ (0.306 or $0.30\overline{5}$ or 0.3055 to 0.3056) or $\frac{1}{6} + \frac{1}{6} \times \frac{5}{6}$ or $(\text{ii}) + 2 \times \text{their } \frac{1}{6} \times \text{their } \frac{5}{6}$ or $\text{their } \frac{1}{6} \times \text{their } \frac{1}{6} + 2 \times \text{their } \frac{1}{6} \times \text{their } \frac{5}{6}$
(c)	5	2	SC1 for answer of 4 or $6^5 = 7776$ seen or $5^4 = 625$ seen or M1 for attempted products of $\left(\text{their } \frac{5}{6}\right)^k \times \text{their } \frac{1}{6}$, $k > 1$
12 (a)	18.75 (18.7 or 18.8) 18.5 23.5 13	1 1 1 1	
(b) (i)	$r = -4.31t + 120$	2	$-4.313\dots, 120.0\dots$ B1 for $r = -4.31t + c$ or $r = kt + 120$ Allow x for t
(ii)	Negative	1	
(iii)	25 (25.1 to 25.4)	1FT	FT their equation only if linear
13 (a)	$\frac{2}{3}\mathbf{p} + \frac{1}{3}\mathbf{q}$ o.e.	2	M1 for correct route from O to X or $\overrightarrow{PQ} = \mathbf{q} - \mathbf{p}$ o.e. or correct unsimplified answer
(b)	$-\frac{2}{3}\mathbf{p} + \frac{5}{3}\mathbf{q}$ o.e.	3	B2 for $k\mathbf{p} + \frac{5}{3}\mathbf{q}$ or $-\frac{2}{3}\mathbf{p} + k\mathbf{q}$, $k \neq 0$ or correct unsimplified expression or M1 for correct route from X to Y or $-\frac{2}{3}\mathbf{p} + m\mathbf{q} + n\mathbf{q}$, $m \neq 0, n \neq 0$
(c)	± 4	1,1	If 0 scored, M1 for $3^2 + k^2 = 5^2$ o.e.