MARK SCHEME for the May/June 2013 series

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/41   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.
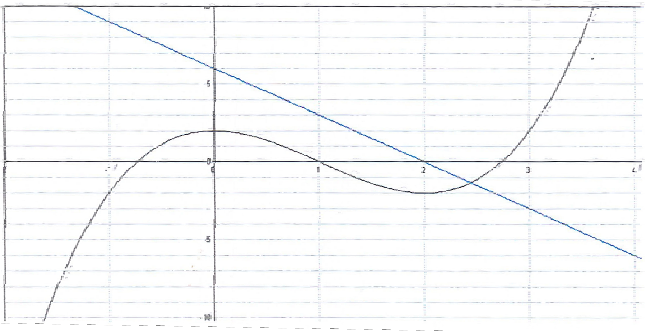
Cambridge will not enter into discussions about these mark schemes.

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.

1	(a)	(i)	$18 000	3	**M2** for 15840 ÷ 0.88 o.e. or **M1** for 15840 = 88% seen
		(ii)	$10 800 or 10790 to 10800	3	**M2** for 15840×0.88^3 or *their* (i) × 0.88^4 or **M1** for 15840 (or 18000) × 0.88^n, $n > 1$
		(iii)	2020	2	**M1** for multiplying by 0.88, 3 more times or $15840 \times 0.88^n = 5000$ o.e. soi by 9.02 or 5010 to 5014 or 4410 to 4413 or **SC1** for 2021.
	(b)		18.2 or (18.15 to 18.16)	4	**M3** for (20000 ÷ 15 × 0.68 + 950 + 1020) ÷ 15840 soi by figs 18159 to 18161 **M2** for 20000 ÷ 15 × 0.68 + 950 + 1020 (2876 to 2877) **M1** for 20000 ÷ 15 × 0.68 (906 to 907)
2	(a)		Reflection $y = -x$ o.e.	1 1	Second transformation loses all marks Independent
	(b)	(i)	Triangle vertices (3, –1), (5, –1), (5, –2)	2	**B1** for 2 vertices correct or rotation 180° about other centre
		(ii)	Triangle vertices (0, –2), (4, – 2), (4, –4)	2FT	**B1 FT** for 2 vertices correct or enlargement s.f. 2 correct orientation
		(iii)	Enlargement s.f.–2 centre (2, 0)	1 1 1	Second transformation loses all marks All independent

3	(a)		2	**B1** for correct cubic shape **B1** for max on $x = 0$ and 2 +ve x- intercepts
	(b)	–0.732 or –0.7321 to –0.7320, 1, 2.73 or 2.732…	2	**B1** for any one solution
	(c) (i)	(0, 2), (2, –2)	2	**B1** for each
	(ii)	$-2 < k < 2$	2FT	**FT** (c)(i) Allow $-2 < k$ and $k > 2$ full marks **SC1** for $-2 \leqslant k \leqslant 2$ or better or in words
	(d)	Sketch of line Indication that it only cuts curve once	1 1	
4	(a)	30/cos65 = 70.986…. (Answer Given)	2	**M1** for cos 65 = 30/QC o.e. If using Pythagoras must reach *their* PC^2 + 30^2
	(b)	$\sqrt{(70.99^2 + 20^2 - 2 \times 70.99 \times 20 \times \cos 115)}$ 81.5 or 81.48 to 81.50	M2 A1	Allow correct use of cosine rule in other triangles for **M2** or **M1** **M1** for $(70.99^2 + 20^2 - 2 \times 70.99 \times 20 \times \cos 115)$ If 0 scored **SC1** for answer in range without Cosine rule
	(c)	457 or 457.3 to 457.5	1FT	**FT** 212.97 + 3 × *their* (b).
	(d)	64.3 or 64.4 or 64.33 to 64.36…	2	**M1** for tan 65 = x/30 o.e. (M mark may be seen earlier)
	(e)	1790 or 1800 or 1790 to 1796 www2	2FT	**FT** for $\frac{1}{2}$ × [*their* (d)(i)]² × sin 120 o.e. **M1 FT** for $\frac{1}{2}$ × [*their* (d)(i)]² × sin 120 o.e.
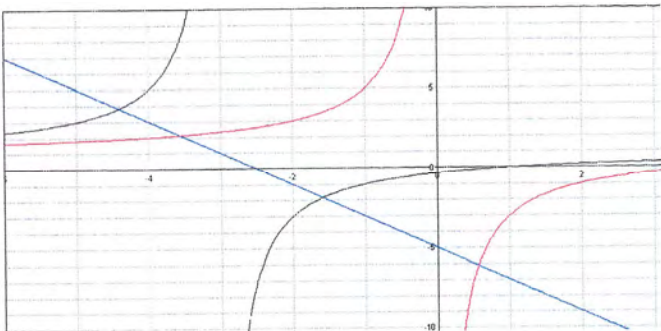
5 (a)	Line from (0, 15) to (6, 0) (if extended) $x = 4$ drawn Line from (0, 12) to (12, 0) (if extended) Region R clearly identified cao	**2** **1** **1** **1**	Lines must be long enough to define region **B1** for line through either point with negative gradient.
(b) (i)	7 cao	**1**	
(ii)	9 cao	**1**	
6 (a)	89.7 or 89.657 to 89.66	**3**	**M2** for $(50 - \frac{1}{2}\pi \times 3^2) \times 2.5$ or $10 \times 2.5 \times 5 - \frac{1}{2}\pi \times 3^2 \times 2.5$ or **M1** for $\frac{1}{2}\pi \times 3^2$ or $10 \times 2.5 \times 5$
(b)	71.7 or 71.8 or 71.72 to 71.76	**1FT**	**FT** for *their* (b) × 0.8
(c)	155 or 155.2 to 155.3	**5**	**M1** for $2 \times 2 \times 2.5 + 10 \times 2.5$ o.e. (horizontal rectangles) (35) **M1** for $2 \times 2.5 \times 5$ (vertical rectangles) (25) **M1** for $10 \times 5 - \frac{1}{2} \times \pi \times 3^2$ o.e. or better (front face) (35.86 or 71.7) **M1** for $\frac{1}{2}\pi \times 6 \times 2.5$ o.e. (arch) (23.56)

7 (a) (i)	38	**1**	
(ii)	32	**2**	**M1** for clear reading off at 35 and 105
(b) (i)	33, 53, 85, 115	**2**	**B1 FT** for any 2
(ii)	8 points plotted Joined by smooth curve	**2FT** **1FT**	**B1 FT** for 5 or more correct All marks depend on frequencies increasing
(iii)	Comparison of speeds or spreads (ranges) Justification referring to median or inter-quartile range	**1** **1**	**SC2** for comparison of speeds and spreads without reasons Mark the best provided there is no contradiction
(iv)	59.1 or 59.05...	**2**	**M1** for at least two midpoints (25, 35, 42.5, 47.5, 55, 70 , 90) soi at least 2 correct products (150, 420, 637.5, 950, 1760, 2100, 2250) or total 8267.5
(v)	Bars of correct width Bars correct heights 3, 4, 3.2, 1.5 and 1.25	**1** **3**	Allow freehand **B2** for 4 correct or **B1** for 2 correct **SC3** for "correct" but interval 40 to 45 and 45 to 50 combined with height of 3.5
8 (a)	$\dfrac{42}{992}$ or 0.0423 or 0.04233 to 0.04234 o.e.	**2**	In all parts accept decimal / % to 3sf but not ratios or words etc. **M1** for $\dfrac{7}{32} \times \dfrac{6}{31}$ o.e.
(b)	$\dfrac{112}{306}$ or 0.366 or 0.3660...o.e.	**3**	**M2** for $\dfrac{4}{18} \times \dfrac{14}{17} + \dfrac{14}{18} \times \dfrac{4}{17}$ o.e. or **M1** for one of above products
(c)	$\dfrac{490}{600}$ or 0.817 or 0.8166 to 0.8167 o.e.	**3**	**M2** for $1 - \dfrac{11}{25} \times \dfrac{10}{24}$ o.e. **M1** for 1 omitted product in $\dfrac{11}{25} \times \dfrac{14}{24} + \dfrac{14}{25} \times \dfrac{11}{24} + \dfrac{14}{25} \times$ $\dfrac{13}{24}$ or for $\dfrac{11}{25} \times \dfrac{10}{24}$ alone

9 (a) (i)	$R = \dfrac{0.2}{d^2}$ o.e.	3	k could be evaluated in part (ii) **M1** for $R = \dfrac{k}{d^2}$ o.e. **M1** for substituting 0.8, 0.5 into $R = \dfrac{k}{d^2}$ or $R = kd^2$ or $R = \dfrac{k}{d}$
(ii)	0.05	1FT	**FT** $R = \dfrac{k}{d^2}$ o.e. with incorrect k only
(iii)	0.224 or 0.2236… cao	2	**M1** for substituting $R = 4$ into $R = \dfrac{k}{d^2}$ or $R = kd^2$ or $R = \dfrac{k}{d}$ with k numerical
(b)	0.5	2	**M1** for $R \div 4$ o.e.
10 (a)		3	Good sketch with no overlaps of asymptotes and no departing from asymptotes. Must have positive x intercept. **B1** for left hand branch to left of $x = -3$ and above $y = 1$ (approx.) **B1** for right hand branch to right of $x = -3$ and below $y = 1$ (approx.)
(b)	$(1, 0)$	1	
(c)	$x = -3$ $y = 1$	1 1	
(d)	$-\frac{1}{3} \leqslant f(x) < 1$	2	Accept y, x etc. Condone 0.333… **B1** for either inequality or $-\frac{1}{3} < f(x) \leqslant 1$
(e)	Sketch of $-5 - 2x$ or formula after $2x^2 + 12x + 14$ o.e. –4.14 or –4.414 ... –1.59 or –1.586 to –1.585	M1 B1 B1	Allow other correct sketch for o.e. **B2** max if no sketch or method shown
(f)	Correct sketch	2	**B1** for translation in x direction **B1** for asymptote at $x = 0$

11 (a)	Any 2 of $ABO = CDO$ (alt angles) $BAO = DCO$ (alt angles) $AOB = COD$ (vert opp angles)	1 + 1	**B1** for any 2 pairs of angles identified without a reason
(b)	10	2	**M1** for $CD/6 = 5/3$ o.e.
(c) (i)	$\dfrac{3}{5}$ o.e.	1	
(ii)	$\dfrac{9}{25}$ o.e.	1	
(iii)	$\dfrac{9}{64}$ o.e.	1	0.141 or 0.1406…
12 (a)	$\dfrac{5500}{x}$	1	
(b)	$\dfrac{5500}{x+60}$	B1	
	$\dfrac{5500}{x} - their\ \dfrac{5500}{x+60} = \dfrac{1}{2}$ o.e.	M1FT	**FT** their expressions
	$5500(x+60) - 5500x = \frac{1}{2}x(x+60)$ o.e. or better	M1FT	Only FT *their* $\dfrac{5500}{x+60} - \dfrac{5500}{x} = \dfrac{1}{2}$ or 30 o.e. or for common denominator or LHS resolved to a single fraction and equated to $\dfrac{1}{2}$ (allow 1 sign error)
	$x^2 + 60x - 660\,000 = 0$	E1	Established without any errors or omissions
(c)	$\dfrac{-60 \pm \sqrt{60^2 - 4(1)(-660\,000)}}{2}$ Or parabola sketched with one +ve and one –ve root 783 –843	M1 B1 B1	If **B0** then **SC1** for correct but both not rounded to nearest whole number 782.9 to 782.96, –842.9 to –842.96
(d)	12 41 or 1242	3	**M1** for $5500 \div$ *their* +ve x **B1** for 0540 or $0940 + \left(\dfrac{5500}{\textit{their } x}\right)$ [in hrs mins] – 4