MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

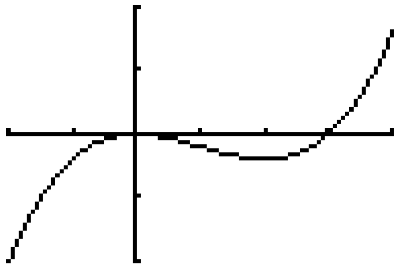**0607/41**   Paper 4 (Extended), maximum raw mark 120

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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
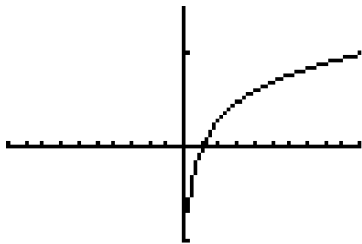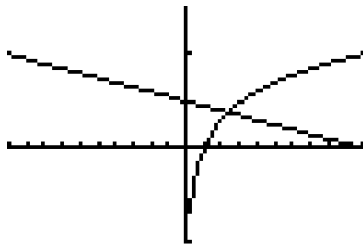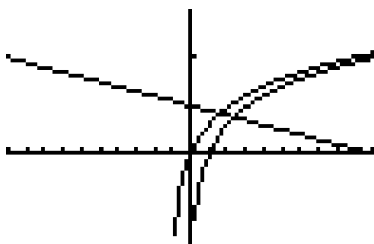
1	**(a)**	11.1(1….)	B3	If B0, M2 for $(28 - 25.2) \div 25.2 \; (\times 100)$ oe M1 for $28 - 25.2$ or $\dfrac{28}{25.2}$ soi
	(b)	21	B3	If B0, M2 for $25.2 \div 1.2$ oe M1 for $120\% = 25.2$
	(c) (i)	34.7 (34.72 to 34.76) final answer	B3	If B0, M2 for 30×1.05^3 oe M1 for 30×1.05^n, $n > 1$ o.e. SC2 for 4.7 or 4.72 to 4.76 or 34.7 or 34.72 to 34.76 seen
	(ii)	5.8 to 5.9 or 6 www 2	B2	If B0, M1 for multiplying 30 by 1.05 more than 3 times or dividing 40 by 1.05 more than 3 times or $30 \times 1.05^n = 40$ oe SC1 for 5 **[11]**
2	**(a)**		B3	B1 for cubic with max then min B1 for x-intercept 3 , (between 2 and 4) B1 for max at origin, 2mm accuracy
	(b)	0, 3	B1	
	(c)	(0, 0) or (2, –4)	B2	B1 for one correct and one incorrect **[6]**
3	**(a) (i)**	Rotation, (0, 0) 90° clockwise oe	B1 B1 B1	All independent
	(ii)	Reflection, $y = -x$ oe	B1 B1	Independent
	(b) (i)	Triangle vertices (–5, 3), (–2, 3), (–2, 5)	B2	SC1 translation $\begin{pmatrix} -6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 2 \end{pmatrix}$
	(ii)	Triangle vertices (1.5, 1), (6, 1), (6, 3)	B2	2mm accuracy for 1.5 SC1 for stretch of P wth s.f 1.5 and invariant line $x = k$ or stretch of P s.f. 1.5 with x-axis invariant. **[9]**
4	**(a) (i)**	60	B1	
	(ii)	135	B2	If B0, M1 for $(5 - 2) \times 180 - (120 +$ their $60 + 140 + 85)$ soi by $195 -$ their **(i)** oe
	(iii)	110	B1	
	(b) (i)	75	B1	
	(ii)	105 ft	B1 ft	ft $180 -$ their **(b)(i)** only if +ve. Can recover to correct answer **[6]**

5	(a)	-4	B2	Condone $(-4, 9)$ M1 for $\frac{3}{6} = \frac{h}{8}$ oe (with $+$ or $-$) or for $y = -\frac{3}{4}x + 6$ implied by answer 4 oe
	(b)	$y = \dfrac{4}{3}x - \dfrac{7}{3}$ or other simplified equation	B4	isw if equation seen and spoiled If B0, B1 for gradient $= \dfrac{4}{3}$, B1 for $(4, 3)$ seen and M1 for correct use of any linear equation form with their $\dfrac{4}{3}$ or their $(4, 3)$ **[6]**
6	(a) (i)	$29.6\ (0....)$	M1 A1	M1 for $0.5 \times 9 \times 7 \times \sin 110$ SC1 for $29.6...$ ww
	(ii)	$9^2 + 7^2 - 2 \times 9 \times 7 \cos 110$ $13.2\ (13.15\ \text{to}\ 13.16)$	M1 A2	If A0, A1 for 173 or 173.1 or 173.09..... SC2 for 13.2 (13.15 to 13.16) ww
	(iii)	120	B2	B1 for 60 or 130 or 50 **and** 70 (with BA extended) seen at A in correct positions
	(b)	$\sqrt{4^2 + 7^2}$ $(\sin R) = \dfrac{\sin 75}{11} \times \text{their}\sqrt{65}$ $45.1\ (45.05 - 45.07)$ cao www 5	M2 M2 A1	soi by $\sqrt{65}$ or 8.06 or 8.062.... (M1 for $4^2 + 7^2$ soi by 65) (M1 for $\dfrac{\sin R}{\text{their}\sqrt{65}} = \dfrac{\sin 75}{11}$) **[12]**
7	(a)	Points at $(70, 14)$, $(20, 70)$, $(44, 46)$ and $(50, 50)$	P2	Points touching correct corners. P1 for 3 points
	(b)	Negative	B1	
	(c)	$-1.14c + 96.8$ $(-1.142...$ and 96.82 to 96.83)	B2	B1 $-1.14c + k$ or $mc + 96.8$ $(-1.142...$ and 96.82 to 96.83) If B0, SC1 if -1.1 and 97 Allow x for c
	(d)	20 or 21 ft	B1ft	ft their equation only if answer is positive integer **[6]**
8	(a)	9	B2	If B0, M1 for $12 \times 6 \div 8$ oe
	(b)	$232.(0........)$	B3	If B0, M2 for $550 \times (6 \div 8)^3$ oe (M1 for $\left(\frac{6}{8}\ oe\right)^3 or \left(\frac{8}{6}\ oe\right)^3$)
	(c)	0.55	B1	**[6]**

9 (a) (i)		B2	B1 for shape B1 for approaching y-axis in 4th quadrant
(ii)	(1, 0)	B1	
(iii)	$x = 0$	B1	
(iv)	$(f(x)) \leq 1$	B2	If k to 1, allow B1. Allow in words. Allow y or x f(x)
(b)	2.4(0) (2.399…)	B2	 If B0, M1 for line added to sketch (negative gradient, positive y-intercept, may be freehand) must cross curve. Pen – 1 if y-coord given
(c)	$0 \leq g(x) \leq 1$	B1B1	Allow in words. Allow y or f(x) or x for g(x). SC1 for $0 < g(x) < 1$
(d)		B1 ft B1	Shape correct translated to left of their original curve ft B1 for passing through origin Condone if stops at origin [12]
10 (a) (i)	22 600 (22608 to 22623)	B2	If B0, M1 for $\pi \times 80 \times 70$ (17584 to 17595.2) Allow 7200π
(ii)	5.43 (5.425 to 5.429…) ft	B3 ft	If B0, M1 for $\div 100^2$ and M1 for $\times 2.40$ (M's independent) ft their (i) $\div 100^2 \times 2.40$
(b) (i)	351 600 to 352 000	B2	If B0, M1 for $\pi \times 40^2 \times 70$ Allow 112000π
(ii)	$\div 8$ $\div 60$ $\div 60$ 12 h 12 or 13 min cao final answer www 4	M1 M1 M1 A1	(43 950 to 44 000) (732.5 to 733.3…) (12.20 to 12.22…) or 12 remainder 12.48 to 13.33. ($8 \times 60 \times 60 = 28800$) [11]

Throughout question 11, do not allow ratios or words. **If decimals or percentages used, usual accuracy applies except penalise two sf by – 1 only once. isw any cancelling/converting to decimal or %**			
11 (a) (i)	$\dfrac{2}{7}$ oe	B1	0.286 (0.2857….)
(ii)	7	B1	Ignore embellishments
(b) (i)	$\dfrac{1}{6}$	B1	
(ii)	$\dfrac{5}{7}, \dfrac{1}{6}, \dfrac{5}{6}, \dfrac{2}{6}, \dfrac{4}{6}$ oe	B2	B1 for 3 or 4 correct
(iii)	$\dfrac{2}{42}$ oe	B2	0.0476 (0.04761 to 0.04762) If B0, M1 for their $\dfrac{2}{7} \times$ their $\dfrac{1}{6}$
(iv)	$\dfrac{20}{42}$ oe	B3	0.476 (0.4761 to 0.4762) If B0, M2 for their $\dfrac{2}{7} \times$ their $\dfrac{5}{6}$ + their $\dfrac{5}{7} \times$ their $\dfrac{2}{6}$ M1 for one of the products
(c)	$\dfrac{40}{210}$ oe	B2	0.19(0) (0.1904 to 0.1905) If B0, M1 for $\dfrac{5}{7} \times \dfrac{4}{6} \times \dfrac{2}{5}$ **[12]**
12 (a)	120, 90, 180	B1B1B1	
(b)	58.75 ft	B2 ft	Accept 58.7 or 58.8 ft their frequencies with correct mid-values If B0, M1 for at least two correct mid-values seen
(c)	180, 290, 380 ft	B2 ft	B1 for 2 correct ft their **(a)**
(d)	(30, 60), (50, 180), (60, 290), (70, 380), (100, 560) ft	P2 ft C1	Points touching lines P1 for 3 or 4 correct ft Smooth curve through these 5 points (0.5 square accuracy) and correct shape
(e) (i)	$58 \le med < 60$ ft	B1 ft	In all parts of **(e)** ft their graph but only if it is cumulative
(ii)	43 to 46 ft	B1 ft	
(iii)	29 to 36 ft	B1 ft	ft is upper quartile – their **(ii)**
(iv)	440 to 460 ft	B2 ft	If B0, SC1ft for 100 to 120 (may be on graph) If use 600 in **all 4** parts mark on ft basis but deduct 2 marks **[15]**

13 (a)	$0.5(x+2)(x+1) = x^2$ or $(x+2)(x+1) = 2x^2$	M1	Must be one of these two forms
	$x^2 + 2x + x + 2$ oe seen	B1	Independent oe includes $\frac{1}{2}x^2 + x + \frac{1}{2}x + 1$
	$x^2 - 3x - 2 = 0$	E1	At least one intermediate line after the M1 and no errors or omissions
(b)		M1	M1 for sketch of parabola with a zero either side of origin or formula correctly used $\dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-2)}}{2(1)}$ or better
	–0.56, 3.56	A1A1	**If M0 or other GDC applications, SC2 for –0.56 and 3.56** If M0 or M1, SC1 for –0.6 **and** 3.6 or –0.561 to –0.562 **and** 3.561 to 3.562
(c)	39. 15 to 39.60.. ft	B2 ft	ft a positive root. If B0, M1 for tan = ((their root + 1) / (their root + 2)) **[8]**