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

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.

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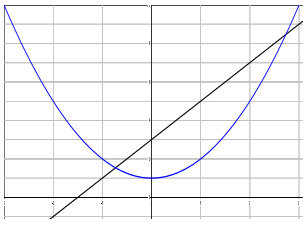
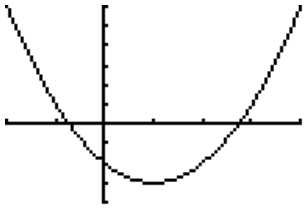
UNIVERSITY of CAMBRIDGE
International Examinations

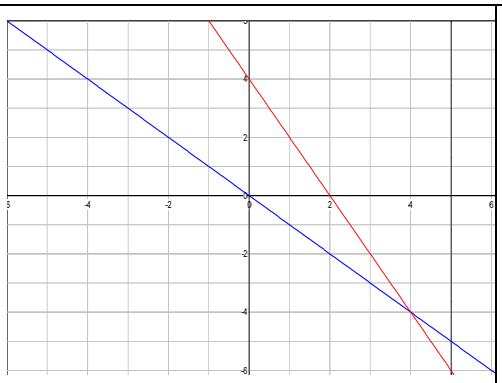
1	**(a) (i)**	160 000 000 oe	**2**	**M1** for $0.0239 \times 6.78 \times 10^9$ oe Implied by $1.62\ldots \times 10^8$ oe
	(ii)	1.6×10^8 or $1.62\ldots.. \times 10^8$	**1ft**	ft their **(i)** or their more accurate value seen in **(i)**
	(b)	0.482 (0.4823…)	**2**	**M1** for $\frac{3.27\times10^7}{6.78\times10^9}$[×100] oe implied by figs 48…
	(c)	2 520 000 000 or $2.52(0) \times 10^9$ or 2520 million	**3**	**SC2** for 2 520 4 - - - - - or $2.5204\ldots \times 10^9$ or 2520.4 million **M2** for ÷ 2.69 oe (**M1** for evidence of 269 (%)) If **M0**, **SC2** for 4 012 000 000 or 4.012×10^9 or 4012 million or **SC1** for 4 010 000 000 or 4 011 8 - - - - - or 4.01×10^9 or $4.0118.. \times 10^9$ or 4011.8 million (this is ÷ by 1.69) **[8]**
2	**(a)**	8.39 (8.393 to 8.394)	**2**	**M1** for 18tan25 oe i.e. explicit expression
	(b)	130 (129.7….) www 3	**3**	**M1** for 0.5 × 18 × their **(a)** oe (75.5 to 75.6) **M1** for 0.5 × 18 × 9 × sin 42 oe (54.19 to 54.20)
	(c)	12.8 (12.81….) www 3	**3**	**M1** for $9^2 + 18^2 - 2 \times 9 \times 18 \cos 42$ oe **A1** for 164.2…. seen **[8]**
3	**(a) (i)**	$\begin{pmatrix} 5 \\ -3 \end{pmatrix}$	**1**	
	(ii)	5.83 (5.830 to 5.831) ft	**2 ft**	ft their **(i)**. Allow $\sqrt{34}$ as final answer **M1** for $5^2 + 3^2$ oe
	(b) (i)	Reflection , $x = 5$	**2**	**B1, B1** independent lose all marks if extra transformation
	(ii)	Enlargement, (0, 0) [Factor] 3	**3**	**B1, B1, B1** independent lose all marks if extra transformation **[8]**
4	**(a)**	29.4	**2**	**M1** for indication of use of mid-values (implied by figs 294)
	(b)	Curve through (20, 20), (30, 56), (40, 88), (80, 100)	**3**	**B1** for 56, 88 and 100 seen **P1** ft for three correct plots ft attempt at cum. frequencies. **C1** for correct shape through at least 2 of their points
	(c) (i)	$27 \leq t < 30$	**1**	
	(ii)	12 to 15	**2**	**Dependent on P1** **M1** for (34 to 37) or (21 to 22)
	(iii)	100 – their reading off cum freq graph (0.5 square accuracy)	**2**	Must be an integer. **SC1** for their reading off cum freq graph (0.5 square accuracy) – may be on graph or answer 62 **[10]**

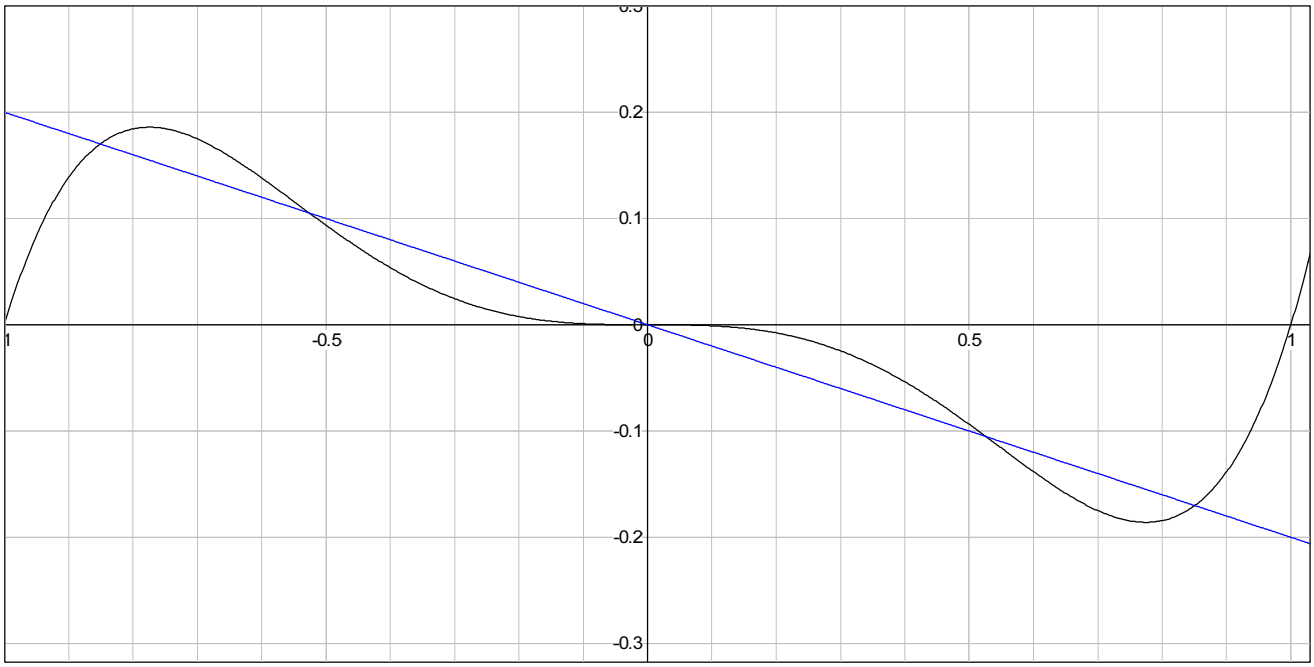
5 (a) (i)	1810 (1808 to 1810)	**3**	Allow 576π as final answer **M1** for $\frac{1}{3}\pi \times 8^2 \times 11 (\frac{704}{3}\pi$, 736.8 to 737.3…) **M1** for $\frac{2}{3}\pi \times 8^3 (\frac{1024}{3}\pi$, 1071 to 1072….)
(ii)	2.08 (2.079 to 2.082)	**2 ft**	ft their **(i)** × 1.15 ÷ 1000 oe **M1** for their **(i)** × figs 115 soi by figs 208 or 2079 to 2082
(b) (i)	744 (743.5 to 744.2) www 4	**4**	**M1** for (sloping edge)^2 = $11^2 + 8^2$ or better seen (= 185) (sq root = 13.60…) **M1** for cone = $\pi \times 8 \times \sqrt{their(11^2 + 8^2)}$ (soi by 341.6 to 341.9) **M1** for hemisphere = $2\pi \times 8^2$ soi (401.9 to 402.2)
(ii)	0.11	**2 ft**	ft 81.5 ÷ their **(i)** with same rounding requirement **SC1** ft for 0.1094 to 0.1096.. or 0.110 **[11]**
6 (a) (i)	86	**1**	
(ii)	188	**1**	
(iii)	4	**2 ft**	ft 0.5 × their **(ii)** – 90 if answer positive **B1** for angle *BOD* = 172 (may be on diagram)
(b)	46	**2**	**SC1** for angle *DBC* = 46 or angle *BAC* = 40 (may be on diagram) **[6]**
7 (a)	68.6 (68.57..)	**2**	**M1** for 720 ÷ (7.5 + 3) or better
(b) (i)	$9x$ or $9 \times x$ or $x \times 9$	**2**	**M1** for $7.5 \times x$ or $3 \times \frac{x}{2}$ (not from $x + \frac{x}{2}$)
(ii)	80 ft	**1 ft**	ft 720 ÷ their coefficient of x where answer to **(b)(i)** is in simplified form
(c)	5 : 1 oe	**2**	Allow non-reduced e.g. 600 : 120 or 7.5 : 1.5 isw incorrect cancelling after correct answer **M1** for 7.5 × their **(b)(ii)** and 1.5 × their **(b)(ii)** **[7]**

8 (a) (i)		**2**	for reasonable shape including horizontal inflexion **SC1** for poor quality e.g. cubic
(ii)	$-1, 0, 1$	**3**	**B1, B1, B1**
(iii)	(0.775 or 0.7745 to 0.7746, – 0.186 or – 0.1859…)	**2**	**B1, B1** **SC1** for 0.77 or 0.78 **and** – 0.19
(iv)	0.5	**1**	Condone – 1.04 or – 1.041 to – 1.040 or 0.942 or 0.9423…
(v)	Rotational, [order]2 or point symmetry [about] (0, 0)	**3**	**B2** (or **B1** for rotational) condone 180 for order 2 **B1** Deduct 1 if line symmetry also given
(b) (i)	$y = -\frac{x}{5}$ oe	**1**	
(ii)	Reasonable line through origin with negative gradient	**1**	Must cut curve 5 times
(iii)	$\pm$ 0.851 or $\pm$ 0.8506 to 0.8507, 0	**2**	**B1, B1** **[15]**

9	Allow non-reduced fractions and decimals or percentages. Do not allow words or ratios. isw any incorrect cancelling or converting		
(a)	$\frac{8}{30}$ oe www 2	**2**	**M1** for $\frac{2}{5}\times\frac{4}{6}$ oe (0.266 to 0.267)
(b)	$\frac{108}{540} = \frac{1}{5}$ oe www 3	**3**	**M2** for $\frac{2}{3}\times\frac{2}{5}\times\frac{1}{4}+\frac{1}{3}\times\frac{4}{6}\times\frac{3}{5}$ oe (**M1** for either product)
(c)	3	**3**	**M2** for combining valid probabilities e.g. $\frac{4}{6}$ then $\times \frac{3 \text{ or } 2}{5}$ (**M1** for first probability tried $\frac{4}{6}$) **[8]**

10 (a)		**2**	Exponential shape over full domain cutting positive x-axis and negative y-axis **SC1** for partial domain only or slight upturn at left hand side
(b)	$y = -3$ oe	**1**	
(c) (i)	$-2.75 \leq f(x) \leq 1$	**2**	**B1, B1** Allow in words. Condone < . Allow y or x for f(x)
(ii)	$f(x) > -3$	**1**	Allow $f(x) \geq -3$ and allow y or x and/or words
(d)	$\frac{\log 3}{\log 2}$ or $\log_2 3$ final answer	**2**	**SC1** for 1.58 or 1.584 to 1.585 – may be on diagram or $\frac{\log 3}{\log 2}$ or $\log_2 3$ seen **[8]**
11 (a)	-9	**2**	**B1** for -6 seen
(b)	-4	**2**	**M1** for $2x + 3 = x - 1$ or better
(c)	  $-0.73, 2.73$ cao	**2**	**B2** Curve(s) could be for other equation(s) but must lead to 2 correct solutions. Allow **B1** for curve leading to correct solutions but poor quality. Use of formula, **B1** for $\sqrt{(-2)^2 - 4(1)(-2)}$ or better, seen anywhere If form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or better B1 for $p = -(-2), r = 2(1)$ or better $\frac{2 \pm \sqrt{12}}{2}$ Use of completing the square **B1** for a correct completed square then **B1** for correct explicit statement for x. **B1 B1** If 0 scored, **SC1** for -0.7 or -0.7321 to -0.7320 **and** 2.7 or 2.7320 to 2.7321 Without working – **maximum score of 2**
(d)	$\frac{x-3}{2}$ oe final answer	**2**	**M1** for $x = 2y + 3$ or $y - 3 = 2x$ or $\frac{y}{2} = x + \frac{3}{2}$ i.e. a correct first step
(e)	$\frac{3x+2}{(2x+3)(x-1)}$ final answer	**3**	Allow $2x^2 + x - 3$ for denominator. **M1** for denominator $(2x+3)(x-1)$ or $2x^2 + x - 3$ **M1** for numerator $(x-1) + (2x+3)$ with or without brackets **[13]**

12 (a)		**3**	**B1** $x = 5$ ruled **B1** $y = -x$ ruled 1mm accuracy at (– 2, 2) and (2, – 2) **B1** $y = 4 - 2x$ ruled Allow 1 mm accuracy at (0, 4) and (2, 0) In each case line must be long enough to enclose area in next part
(b)	Region correct cao	**2**	**Dep on B3** **SC1** if correct side of three correct boundaries
(c)	$h = 3, k = -1$ cao	**2**	**SC1** for other point in region such that $x + 3y = 0$ **[9]**
13 (a)	Points (50, 8), (55, 10) and (45, 13) plotted	**2**	**P1** for 2 correct points
(b)	Negative correlation cao	**1**	
(c) (i)	47 cao	**1**	
(ii)	11.9 cao	**1**	
(d)	$-0.312x + 26.6$ or – 0.3123…x + 26.58…	**2**	isw if correct answer rounded **B1** for $-0.312x + c$ or $kx + 26.6$ **SC1** for $-0.31x + 27$
(e)	16.6	**1 ft**	ft their linear equation in **(d)**. Allow 17. Allow 2 sf in ft
(f)	Ruled line from x = 30 to 55, through (their 47, their 11.9) with 1 mm accuracy and 18 on the vertical axis with 1 small square accuracy	**2**	**B1** if ruled line through mean point with negative gradient
(g)	Their integer reading at x = 43	**1 ft**	Integer only **Strict ft their graph if ruled line with negative gradient** **[11]**



y=x^5-x^3
y=-x/5