

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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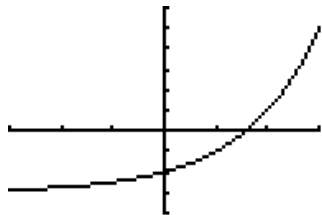
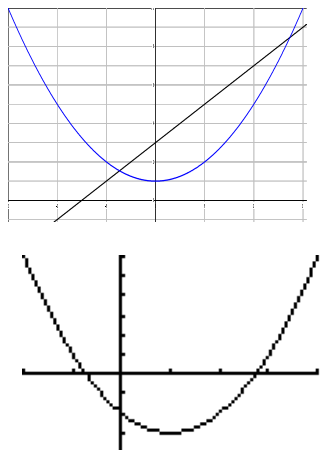
1 (a) (i)	160 000 000 oe	2	M1 for $0.0239 \times 6.78 \times 10^9$ oe Implied by $1.62... \times 10^8$ oe
(ii)	1.6×10^8 or $1.62... \times 10^8$	1ft	ft their (i) or their more accurate value seen in (i)
(b)	0.482 (0.4823...)	2	M1 for $\frac{3.27 \times 10^7}{6.78 \times 10^9} [\times 100]$ oe implied 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 $2.5204... \times 10^9$ or 2520.4 million M2 for $\div 2.69$ 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 \div by 1.69) [8]
2 (a)	8.39 (8.393 to 8.394)	2	M1 for $18 \tan 25$ oe i.e. explicit expression
(b)	130 (129.7....) www 3	3	M1 for $0.5 \times 18 \times$ their (a) oe (75.5 to 75.6) M1 for $0.5 \times 18 \times 9 \times \sin 42$ 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]

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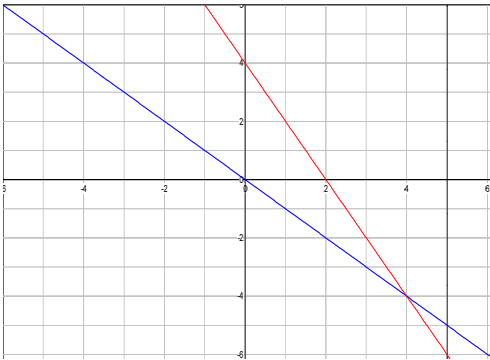
5	(a) (i)	1810 (1808 to 1810)	3	Allow 576π as final answer M1 for $\frac{1}{3}\pi \times 8^2 \times 11$ ($\frac{704}{3}\pi$, 736.8 to 737.3...) M1 for $\frac{2}{3}\pi \times 8^3$ ($\frac{1024}{3}\pi$, 1071 to 1072....)
	(ii)	2.08 (2.079 to 2.082)	2 ft	ft their (i) $\times 1.15 \div 1000$ oe M1 for their (i) \times 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 = $\pi \times 8 \times \sqrt{\text{their}(11^2 + 8^2)}$ (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 $81.5 \div$ 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 $0.5 \times$ 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 $720 \div (7.5 + 3)$ 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 $720 \div$ 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 $7.5 \times$ their (b)(ii) and $1.5 \times$ their (b)(ii) [7]

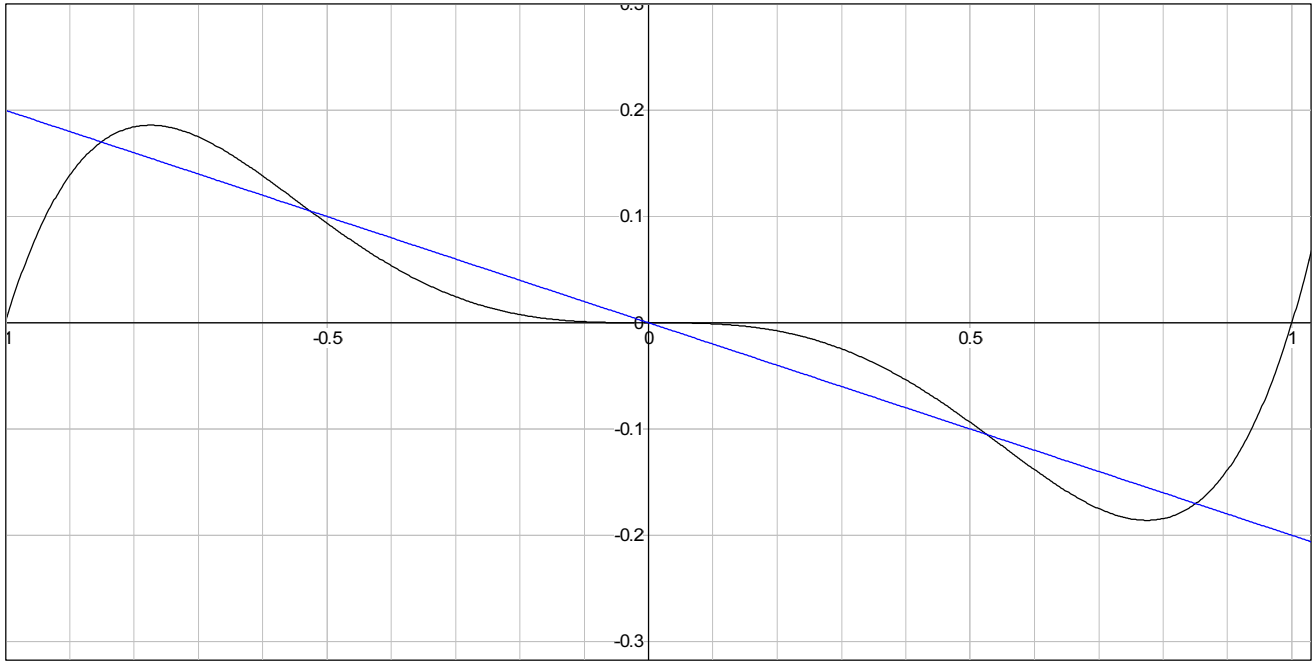
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<p>8 (a) (i)</p>  <p>(ii) -1, 0, 1</p> <p>(iii) (0.775 or 0.7745 to 0.7746, -0.186 or -0.1859...)</p> <p>(iv) 0.5</p> <p>(v) Rotational, [order]2 or point symmetry [about] (0, 0)</p> <p>(b) (i) $y = -\frac{x}{5}$ oe</p> <p>(ii) Reasonable line through origin with negative gradient</p> <p>(iii) ± 0.851 or ± 0.8506 to 0.8507, 0</p>		<p>2</p> <p>3</p> <p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>1</p> <p>2</p>	<p>for reasonable shape including horizontal inflexion SC1 for poor quality e.g. cubic</p> <p>B1, B1, B1</p> <p>B1, B1 SC1 for 0.77 or 0.78 and -0.19</p> <p>Condone -1.04 or -1.041 to -1.040 or 0.942 or 0.9423...</p> <p>B2 (or B1 for rotational) condone 180 for order 2 B1 Deduct 1 if line symmetry also given</p> <p>Must cut curve 5 times</p> <p>B1, B1 [15]</p>
<p>9</p> <p>(a)</p> <p>(b)</p> <p>(c)</p>	<p>Allow non-reduced fractions and decimals or percentages. Do not allow words or ratios. isw any incorrect cancelling or converting</p> <p>$\frac{8}{30}$ oe www 2</p> <p>$\frac{108}{540} = \frac{1}{5}$ oe www 3</p> <p>3</p>	<p>2</p> <p>3</p> <p>3</p>	<p>M1 for $\frac{2}{5} \times \frac{4}{6}$ oe (0.266 to 0.267)</p> <p>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)</p> <p>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]</p>

<p>10 (a)</p>  <p>(b) $y = -3$ oe</p> <p>(c) (i) $-2.75 \leq f(x) \leq 1$</p> <p>(ii) $f(x) > -3$</p> <p>(d) $\frac{\log 3}{\log 2}$ or $\log_2 3$ final answer</p>		<p>2</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p>	<p>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</p> <p>Allow $f(x) \geq -3$ and allow y or x and/or words</p> <p>B1, B1 Allow in words. Condone $<$. Allow y or x for $f(x)$</p> <p>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]</p>
<p>11 (a) -9</p> <p>(b) -4</p> <p>(c)</p>  <p>$-0.73, 2.73$ cao</p> <p>(d) $\frac{x-3}{2}$ oe final answer</p> <p>(e) $\frac{3x+2}{(2x+3)(x-1)}$ final answer</p>	<p>-9</p> <p>-4</p> <p>$-0.73, 2.73$ cao</p> <p>$\frac{x-3}{2}$ oe final answer</p> <p>$\frac{3x+2}{(2x+3)(x-1)}$ final answer</p>	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>3</p>	<p>B1 for -6 seen</p> <p>M1 for $2x + 3 = x - 1$ or better</p> <p>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.</p> <p>Use of formula, B1 for $\sqrt{(-2)^2 - 4(1)(-2)}$ or better, seen anywhere</p> <p>If form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or better B1 for $p = -(-2), r = 2(1)$ or better $\frac{2 \pm \sqrt{12}}{2}$</p> <p>Use of completing the square B1 for a correct completed square then B1 for correct explicit statement for x.</p> <p>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</p> <p>M1 for $x = 2y + 3$ or $y - 3 = 2x$ or $\frac{y}{2} = x + \frac{3}{2}$ i.e. a correct first step</p> <p>Allow $2x^2 + x - 3$ for denominator.</p> <p>M1 for denominator $(2x + 3)(x - 1)$ or $2x^2 + x - 3$</p> <p>M1 for numerator $(x - 1) + (2x + 3)$ with or without brackets [13]</p>

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



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