

MARK SCHEME for the May/June 2009 question paper
for the guidance of teachers

0607 CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/04

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.

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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

M marks are given for a correct method.

A marks are given for an accurate answer following a correct method.

B marks are given for a correct statement or step.

D marks are given for a clear and appropriately accurate drawing.

P marks are given for accurate plotting of points.

E marks are given for correctly explaining or establishing a given result.

Abbreviations

cao correct answer only

cso correct solution only

ft follow through

oe or equivalent

soi seen or implied

ww without working

www without wrong working

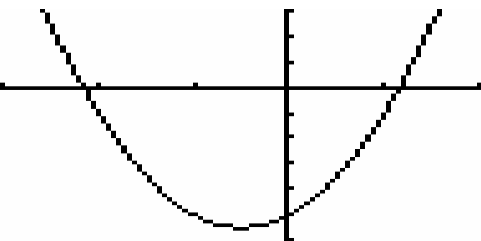
Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

1 (a)	200 (or 2200) ÷ 20 10 (or 200) × 11 oe	M1 M1	Implied by 10 Independent
(b)	57.5(0)	B2	If B0 , M1 for $\frac{50 \times 5 \times 3}{100}$ oe (Implied by 7.50)
(c)	67.49 as final answer	B3	If B0 , M2 for $60 \left(1 + \frac{4}{100}\right)^3$ oe M1 for × 1.04 more than once oe 67.49.... or 67.5 imply M2

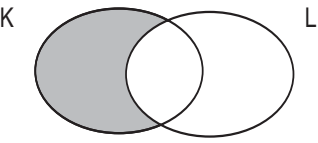
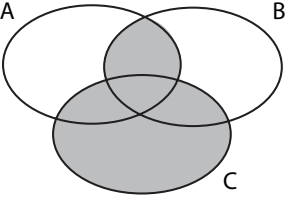
[7]

2 (a)	37.2 (or 37.20 – 37.21)	B1	
(b)	37	B1	
(c)	36	B1	
(d)	36	B1	
(e)	2	B1	

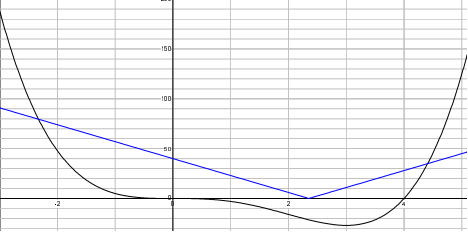
[5]

3 (a)	$(x + 2y)(2 + p)$	B2	B1 for $2(x + 2y) + p(x + 2y)$ o.e.
(b)	 <p>Reasonable sketch of parabola (U shape) cutting x-axis either side of y-axis – dep</p> <p>–2.16, 1.16</p>	M1 M1dep A1, A1	<p>If using formula, M1 for $\sqrt{2^2 - 4(2)(-5)}$ seen</p> <p>and if form $\frac{p + (or-) \sqrt{q}}{r}$ then M1 for $p = -2$ and $r = 2 \times 2$</p> <p>$\left(\frac{-2 \pm \sqrt{44}}{4}\right)$</p> <p>SC1 for –2.2, 1.2 or –2.158..., 1.158... with or without working SC2 for –2.16, 1.16 without working</p>
(c)	$y = k\sqrt{w}$ $4 = k\sqrt{9}$ $(y) = 8$	M1 M1 A1	<p>If using $\frac{y}{4} = \frac{\sqrt{36}}{\sqrt{9}}$ M2</p> <p>$k = \frac{4}{3}$ implies M2</p>

[9]

4 (a)		B1	
(b)		B2	SC1 for any 4 of the 5 parts shaded
(c)	4	B2	Allow B2 for embedded if clear If B0, B1 for Venn diagram with universal set containing 2 intersecting sets or $6 + 10 - (20 - 8)$ or better seen or $10 - x + x + 6 - x = 20 - 8$ oe

[5]

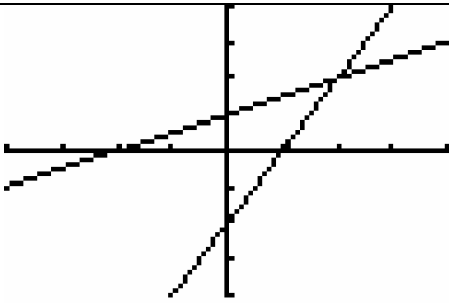
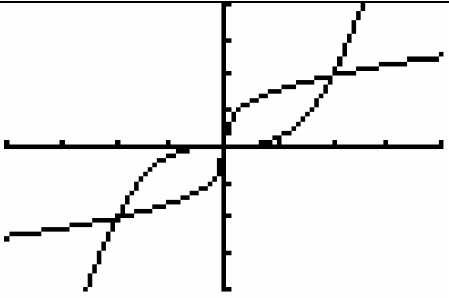
5 (a) (i)	 <p>Correct shape Point of inflexion at origin</p>	B1 B1dep	
(ii)	Correct shape Correct position relative to axes	B1 B1dep	
(b)	0, 4 cao	B1,B1	Do not allow any decimals in answers
(c)	(3, -27) cao	B1,B1	Do not allow any decimals in answers
(d)	-2.33 (-2.325...), 4.41 (4.407 – 4.408)	B1,B1	SC1 for -2.3 and 4.4

[10]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

6 (a)	$\frac{35 + \text{their}(1\frac{3}{4} \times 4)}{2\frac{1}{2} + 1\frac{3}{4}}$ 9.88 (9.882...)	www3	M2 A1	M1 for $1\frac{3}{4} \times 4$ or 7 seen
(b) (i)	$10 \div 12.6 \times 60$ oe 47.6 (47.61 – 47.62)	www2	M1 A1	$10 \div 0.21, 0.7936 \times 60$ Allow 48 also www2
(ii)	$12.6 \div 1.05$ oe 12	www2	M1 A1	

[7]

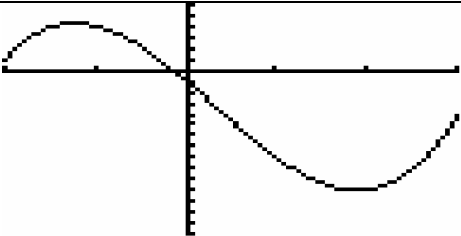
7 (a) (i)	$+ 1, \text{ then } \div 2$ or $\frac{y+1}{2}$ or $x = 2y - 1$ $\frac{x+1}{2}$ oe www2		M1 A1	$\frac{y+1}{2}$ scores M1 only
(ii)			B1	Reasonable sketch to be close to (-1,0), (0, 0.5) and (1, 1) 2 mm accuracy
(b) (i)	$\sqrt[3]{x}$ oe		B1	
(ii)			B1 B1dep	Correct shape. Intersecting $y = x^3$ between $x = 0.5$ and 1.5 and close to $y = x$.
(iii)	Reflection $y = x$		B1 ft B1 ft	ft only if their graph is a reflection correct or ft

[8]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

8 (a) (i)	$\frac{3^2 + 5^2 - 7^2}{2 \cdot 3 \cdot 5}$ 120°	M2 A1	M1 for correct implicit equation $7^2 = \dots$ Any other method must be complete and scores M2 Without any working SC2 If M0 , but 60° after some working SC1 Radians answer 2.09 without working SC1
(ii)	0.5 × 3 × 5 sin(their 120) oe 6.5(0) (6.495.....) ft www2	M1 A1 ft	(For Hero's formula $s = 7.5$) ft their angle with relevant sides
(b) (i)	(0)40	B1	
(ii)	280 cao	B2	M1 for 100 (or 220 – their (a)(i)) at <i>P</i> or 80 (or their (a)(i) – 40) at <i>B</i> soi

[8]

9 (a)	 <p>Reasonable sketch of cubic with two turning points seen in correct order 2 turning points in correct quadrants</p>	B1 B1dep	Penalty –1 for double or feathery lines
(b)	–11.1 to 4.24 (–11.05.... to 4.236...) as final answer	B1,B1	SC1 –11 to 4.2 or SC1 for both 3 sf (or more) numbers seen

[4]

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

10			Throughout the question ratios score zero. If using decimals, 2 s.f. correct answers – penalty of 1 once Use of words e.g. 5 in 28 or 5 out of 28, correct answers – penalty of one once. For method marks only accept probabilities between 0 and 1
(a) (i) (ii), (iii)	$\frac{14}{28}$ oe , $\frac{5}{28}$ (0.179) , $\frac{9}{28}$ (0.321)	B1,B1,B1	0.5, 0.1785 – 0.1786, 0.3214...
(b) (i)	$\frac{14}{28} \times \frac{14}{28}$ $\frac{196}{784}$ oe $(\frac{1}{4})$ www 2	M1 A1	
(ii)	$2 \times \frac{14}{28} \times \frac{5}{28}$ oe $\frac{140}{784}$ oe $(\frac{5}{28})$, (0.179)	M1 A1	0.1785 – 0.1786
(iii)	$1 - \frac{9}{28} \times \frac{9}{28}$ oe $\frac{703}{784}$ oe (0.897) www 2	M1 A1	0.8966 – 0.8967
			[9]

11 (a)	Similar	B1	Allow enlargement oe
(b) (i)	$\frac{QT}{2.5} = \frac{6}{3}$ oe 5 www2	M1 A1	
(ii)	$(\frac{6}{3})^2$ or k^2 oe 11.2 cao www2	M1 A1	k must be from (i)
(iii)	$\sin X = \frac{\sin 26.5}{3} \times 2.5$ 21.8 (21.82 – 21.83) www3	M2 A1	M1 for any correct implicit form e.g. $\frac{\sin X}{2.5} = \frac{\sin 26.5}{3}$ Radians 0.9546.. ww implies M2
			[8]

Page 8	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

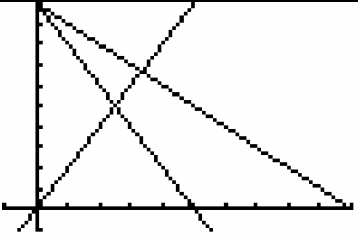
12 (a)	$\frac{30}{360} \times \pi \times 24$ oe 6.28 (6.28 – 6.284) www2	M1 A1	Accept 2π
(b)	$\frac{30}{360} \times \pi \times 12^2$ 37.7 (37.68 – 37.70..) www2	M1 A1	Accept 12π
(c)	their (b) $\times 3$ 113 (113.0 – 113.1..) ft www2	M1 A1ft	Accept 36π
(d)	their (b) $\times 2$ $2 \times 3 \times 12$ their (a) $\times 3$ 166 (166.2 – 166.3) cao www4	M1 M1 M1 A1	Accept $30\pi + 72$

[10]

13 (a)	10 correct points	B3	B2 for 8 or 9 correct points, B1 for 6 or 7 points
(b)	Positive	B1	Ignore any wording which does not spoil answer Accept accurate description linking height to points
(c) (i) (ii)	179.9, 53.2	B1,B1	Accept 180 for 179.9
(d) (i)	$(p) = 0.386h - 16.2$ (0.3855 – 0.3856) (–16.16...)	B2	If seen in correct form B1 for 0.386, B1 for –16.2. (Allow 0.39) SC1 if in correct form and both terms correct to 2 sf
(ii)	Line through their (179.9, 53.2) seen to be plotted. Would extend to p -axis within 3 squares of 45	B1 B1	Must be ruled and be from at least 165 to 190 Gradient must be positive SC1 if accurate and not ruled
(iii)	52 or 53 or 54	B1	Must be integer

[11]

Page 9	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – May/June 2009	0607	04

14 (a)	 <p> $y = 2x$ through $(0, 0)$ and $(5, 10)$ $x + y = 10$ through $(10, 0)$ and $(0, 10)$ $2x + y = 10$ through $(5, 0)$ and $(0, 10)$ </p>	L1 L1 L1	Each straight line ruled Max 2 if not ruled Allow 2 mm accuracy at points indicated
(b)	Correct region unshaded ft	B1 ft	Allow indication by label T if clear ft only $y = \frac{1}{2}x$ for $y = 2x$
(c) (i)	3.2 – 3.4 ft	B1 ft	ft their region in (b) if B1 scored (ans 6.6...if ft in (b)) or region T_2 if (a) correct (ans 2.5).
(ii)	3	B1	ft their region in (b) if B1 scored (ans 6 if ft in (b)) or region T_2 if (a) correct (ans 2).
(d)	1, 9 2, 7 ft	B1 ft B1 ft	ft their T . Only full ft solutions and at least 2 pairs score B2 ft. Treat as ordered pairs unless labelled $x = .., y =$ SC1 if all reversed

[8]

15 (a) (i)	30	B1	
(ii)	$\frac{360}{x}$	B1	Not $x =$
(iii)	$\frac{360}{x+8}$	B1	Not $x =$
(b) (i)	$\frac{360}{x} - \frac{360}{x+8} = 16$ oe $360(x+8) - 360x = 16x(x+8)$ oe $360x + 2880 - 360x = 16x^2 + 128x$ $16x^2 + 128x - 2880 = 0$ $x^2 + 8x - 180 = 0$	M2 M1 E1	SC1 for sign errors Dep on M2 or SC1 , for correctly putting all three terms over common denominator or multiplying throughout by x and $x + 8$. Dependent on M2 M1 . At least one of these two lines oe before final conclusion without any errors or omissions. Condone the absence of $= 0$ only once
(ii)	$(x + 18)(x - 10)$	B2	If B0 , SC1 for $(x \pm p)(x \pm q)$ with values of 10 and 18 for p and q
(iii)	-18, 10 ft	B1 ft	Correct or ft SC1
(iv)	10	B1 ft	Can ft a positive root

[11]