UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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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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

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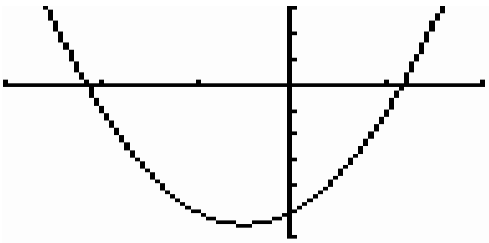
1 (a)	200 (or 2200) ÷ 20 10 (or 200) × 11 oe	**M1** **M1**	Implied by 10 Independent
(b)	57.5(0)	**B2**	If **B0**, **M1** for $\frac{50\times5\times3}{100}$ oe (Implied by 7.50)
(c)	67.49 as final answer	**B3**	If **B0**, **M2** for $60\left(1+\frac{4}{100}\right)^3$ oe **M1** for × 1.04 more than once 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)	 Reasonable sketch of parabola (U shape) cutting x-axis either side of y-axis – dep –2.16, 1.16	 **M1** **M1dep** **A1, A1**	If using formula, **M1** for $\sqrt{2^2-4(2)(-5)}$ seen and if form $\frac{p+(or-)\sqrt{q}}{r}$ then **M1** for $p = -2$ and $r = 2\times2$ $\left(\frac{-2\pm\sqrt{44}}{4}\right)$ **SC1** for –2.2, 1.2 or –2.158…, 1.158… with or without working **SC2** for –2.16, 1.16 without working
(c)	$y = k\sqrt{w}$ $4 = k\sqrt{9}$ $(y) = 8$ www3	**M1** **M1** **A1**	If using $\frac{y}{4}=\frac{\sqrt{36}}{\sqrt{9}}$ **M2** $k = \frac{4}{3}$ implies **M2** **[9]**

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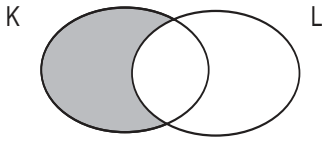
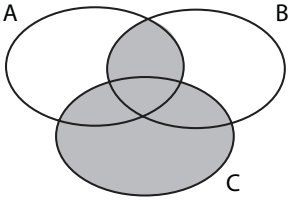
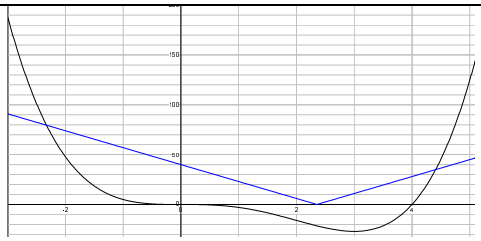
4 (a)		**B1**	
(b)		**B2**	**SC1** for any 4 of the 5 parts shaded
(c)	4	**B2**	Allow **B2** for embedded if clear If **B0**, **B1** for Venn diagram with universal set containing 2 intersecting sets or $6 + 10 – (20 – 8)$ or better seen or $10 – x + x + 6 – x = 20 – 8$ oe **[5]**

5 (a) (i)	 Correct shape Point of inflexion at origin	**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]**

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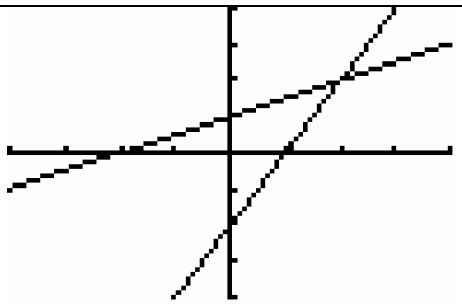
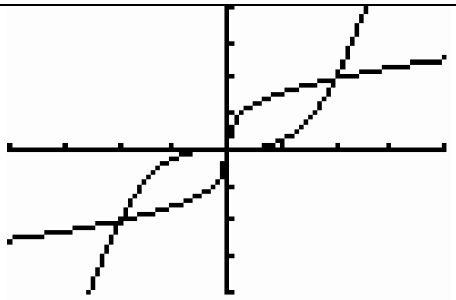
6 (a)	$\frac{35 + \text{their}(1\frac{3}{4} \times 4)}{2\frac{1}{2} + 1\frac{3}{4}}$ 9.88 (9.882…) www3	**M2** **A1**	**M1** for $1\frac{3}{4} \times 4$ or 7 seen
(b) (i)	$10 \div 12.6 \times 60$ oe 47.6 (47.61 – 47.62) www2	**M1** **A1**	$10 \div 0.21$, 0.7936×60 Allow 48 also www2
(ii)	$12.6 \div 1.05$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

7 (a) (i)	+ 1, then ÷ 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]**

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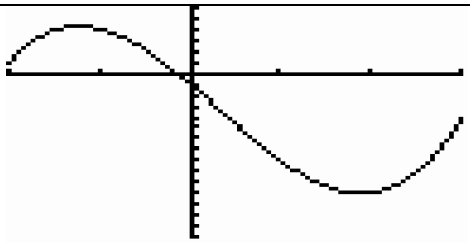
8 (a) (i)	$\frac{3^2+5^2-7^2}{2.3.5}$ 120°	**M2** **A1**	**M1** for correct implicit equation $7^2 = \ldots$ Any other method must be **complete** and scores **M2** Without any working **SC2** If **M0**, but 60° after some working **SC1** Radians answer 2.09 without working **SC1**
(ii)	0.5 × 3 × 5 sin(their 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 *P* or 80 (or their **(a)(i)** – 40) at *B* soi **[8]**

9 (a)	 Reasonable sketch of cubic with two turning points seen in correct order 2 turning points in correct quadrants	 **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]**

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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 $\left(\frac{1}{4}\right)$ www 2	**M1** **A1**	
(ii)	$2\times\frac{14}{28}\times\frac{5}{28}$ oe $\frac{140}{784}$ oe $\left(\frac{5}{28}\right)$, (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)	$\left(\frac{6}{3}\right)^2$ 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]**

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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)** × 3 113 (113.0 – 113.1..) **ft** www2	**M1** **A1ft**	Accept 36π
(d)	their **(b)** × 2 2 × 3 × 12 their **(a)** × 3 166 (166.2 – 166.3) cao www4	**M1** **M1** **M1** **A1**	Accept 30π + 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]**

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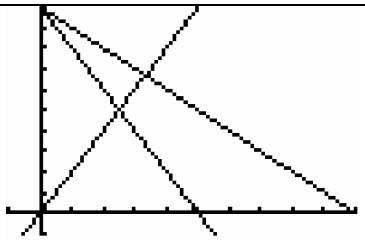
14 (a)	 $y = 2x$ through (0, 0) and (5, 10) $x + y = 10$ through (10, 0) and (0, 10) $2x + y = 10$ through (5, 0) and (0, 10)	**L1** **L1** **L1**	Each straight line ruled Max 2 if not ruled Allow 2 mm accuracy at points indicated
(b)	Correct region unshaded ft	**B1 ft**	Allow indication by label *T* 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]**

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