**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.

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

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

CIE is publishing the mark schemes for the May/June 2009 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

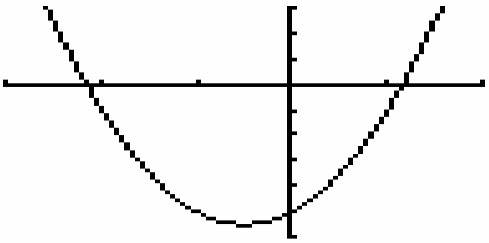
**M** marks are given for a correct method.
**A** marks are given for an accurate answer following a correct method.
**B** marks are given for a correct statement or step.
**D** marks are given for a clear and appropriately accurate drawing.
**P** marks are given for accurate plotting of points.
**E** marks are given for correctly explaining or establishing a given result.

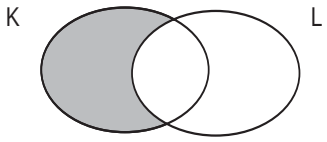
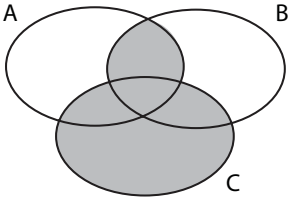
**Abbreviations**

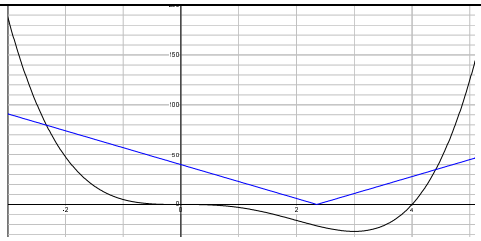
| | |
|---|---|
| cao | correct answer only |
| cso | correct solution only |
| ft | follow through |
| oe | or equivalent |
| soi | seen or implied |
| ww | without working |
| www | without wrong working |

| | | | |
|---|---|---|---|
| **1 (a)** | 200 (or 2200) ÷ 20<br>10 (or 200) × 11 oe | **M1**<br>**M1** | Implied by 10<br>Independent |
| **(b)** | 57.5(0) | **B2** | If **B0**, **M1** for $\frac{50\times5\times3}{100}$ oe<br>(Implied by 7.50) |
| **(c)** | 67.49 as final answer | **B3** | If **B0**, **M2** for $60\left(1+\frac{4}{100}\right)^3$ oe<br>**M1** for × 1.04 more than once oe<br>67.49…. or 67.5 imply **M2**<br>**[7]** |

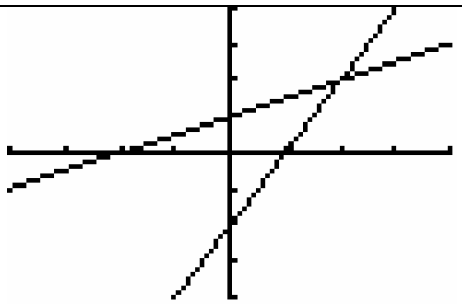
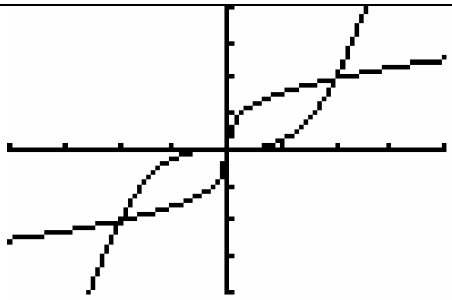
| | | | |
|---|---|---|---|
| **2 (a)** | 37.2 (or 37.20 – 37.21) | **B1** | |
| **(b)** | 37 | **B1** | |
| **(c)** | 36 | **B1** | |
| **(d)** | 36 | **B1** | |
| **(e)** | 2 | **B1** | **[5]** |

| | | | |
|---|---|---|---|
| **3 (a)** | $(x+2y)(2+p)$ | **B2** | **B1** for $2(x+2y)+p(x+2y)$ o.e. |
| **(b)** |  <br>Reasonable sketch of parabola (U shape) cutting $x$-axis either side of $y$-axis – dep<br>–2.16, 1.16 | <br>**M1**<br>**M1dep**<br>**A1, A1** | If using formula, **M1** for $\sqrt{2^2-4(2)(-5)}$ seen<br>and if form $\frac{p+(or-)\sqrt{q}}{r}$ then **M1** for $p = -2$ and $r = 2\times2$<br>$\left(\frac{-2\pm\sqrt{44}}{4}\right)$<br>**SC1** for –2.2, 1.2 or –2.158…, 1.158… with or without working<br>**SC2** for –2.16, 1.16 without working |
| **(c)** | $y = k\sqrt{w}$<br>$4 = k\sqrt{9}$<br>$(y) = 8$ www3 | **M1**<br>**M1**<br>**A1** | If using $\frac{y}{4}=\frac{\sqrt{36}}{\sqrt{9}}$ **M2**<br>$k = \frac{4}{3}$ implies **M2**<br>**[9]** |

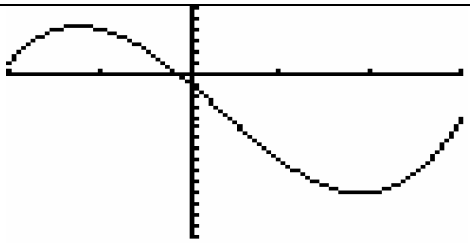
| | | | |
|---|---|---|---|
| **4 (a)** |  | **B1** | |
| **(b)** |  | **B2** | **SC1** for any 4 of the 5 parts shaded |
| **(c)** | 4 | **B2** | Allow **B2** for embedded if clear<br>If **B0**, **B1** for Venn diagram with universal set containing 2 intersecting sets or<br>$6 + 10 – (20 – 8)$ or better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

| | | | |
|---|---|---|---|
| **5 (a) (i)** |  <br>Correct shape<br>Point of inflexion at origin | <br><br>**B1**<br>**B1dep** | |
| **(ii)** | Correct shape<br>Correct position relative to axes | **B1**<br>**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<br>**[10]** |

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

| | | | |
|---|---|---|---|
| **7 (a) (i)** | + 1, then ÷ 2 or $\dfrac{y+1}{2}$ or $x = 2y - 1$<br>$\dfrac{x+1}{2}$ oe www2 | **M1**<br>**A1** | $\dfrac{y+1}{2}$ 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**<br>**B1dep** | Correct shape.<br>Intersecting $y = x^3$ between $x = 0.5$ and 1.5 and close to $y = x$. |
| **(iii)** | Reflection<br>$y = x$ | **B1 ft**<br>**B1 ft** | **ft only if their graph is a reflection**<br>correct or **ft**<br>**[8]** |

| | | | |
|---|---|---|---|
| **8 (a) (i)** | $\frac{3^2+5^2-7^2}{2.3.5}$<br><br>120° | **M2**<br><br>**A1** | **M1** for correct implicit equation $7^2 =$<br>Any other method must be **complete** and scores **M2**<br>Without any working **SC2**<br>If **M0**, but 60° after some working **SC1**<br>Radians answer 2.09 without working **SC1** |
| **(ii)** | 0.5 × 3 × 5 sin(their 120) oe<br>6.5(0) (6.495……) **ft** www2 | **M1**<br>**A1 ft** | (For Hero's formula s = 7.5)<br>**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<br>**[8]** |

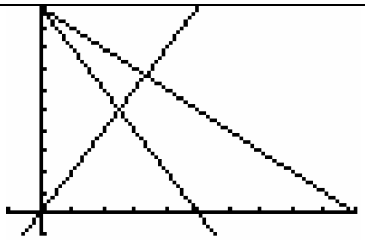
| | | | |
|---|---|---|---|
| **9 (a)** |  <br>Reasonable sketch of cubic with two turning points seen in correct order<br>2 turning points in correct quadrants | <br><br>**B1**<br>**B1dep** | <br><br>Penalty –1 for double or feathery lines |
| **(b)** | –11.1 to 4.24 (–11.05…. to 4.236...) as final answer | **B1,B1** | **SC1** –11 to 4.2<br>or **SC1** for both 3 sf (or more) numbers seen<br>**[4]** |

| | | | |
|---|---|---|---|
| **10** | | | Throughout the question ratios scor… zero.<br>If using decimals, 2 s.f. correct answers – penalty of 1 once<br>Use of words e.g. 5 in 28 or 5 out of 28, correct answers – penalty of one once.<br>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)** | $\frac{14}{28}\times\frac{14}{28}$<br>$\frac{196}{784}$ oe $\left(\frac{1}{4}\right)$ www 2 | **M1**<br>**A1** | |
| **(ii)** | $2\times\frac{14}{28}\times\frac{5}{28}$ oe<br>$\frac{140}{784}$ oe $\left(\frac{5}{28}\right)$, (0.179) | **M1**<br>**A1** | 0.1785 – 0.1786 |
| **(iii)** | $1-\frac{9}{28}\times\frac{9}{28}$ oe<br>$\frac{703}{784}$ oe (0.897) www 2 | **M1**<br>**A1** | 0.8966 – 0.8967<br>**[9]** |

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

| | | | |
|---|---|---|---|
| **12 (a)** | $\frac{30}{360} \times \pi \times 24$ oe<br>6.28 (6.28 – 6.284) www2 | **M1**<br>**A1** | Accept $2\pi$ |
| **(b)** | $\frac{30}{360} \times \pi \times 12^2$<br>37.7 (37.68 – 37.70..) www2 | **M1**<br>**A1** | Accept $12\pi$ |
| **(c)** | their **(b)** × 3<br>113 (113.0 – 113.1..) **ft** www2 | **M1**<br>**A1ft** | Accept $36\pi$ |
| **(d)** | their **(b)** × 2<br>2 × 3 × 12<br>their **(a)** × 3<br>166 (166.2 – 166.3) cao www4 | **M1**<br>**M1**<br>**M1**<br>**A1** | Accept $30\pi$ + 72<br>**[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<br>Accept accurate description linking height to points |
| **(c) (i)**<br>**(ii)** | 179.9, 53.2 | **B1,B1** | Accept 180 for 179.9 |
| **(d) (i)** | $(p) = 0.386h - 16.2$<br>(0.3855 – 0.3856) (–16.16….) | **B2** | If seen in correct form **B1** for 0.386, **B1** for –16.2. (Allow 0.39)<br>**SC1** if in correct form and both terms correct to 2 sf |
| **(ii)** | Line through their (179.9, 53.2) seen to be plotted.<br>Would extend to $p$-axis within 3 squares of 45 | **B1**<br>**B1** | Must be ruled and be from at least 165 to 190<br>Gradient must be positive<br>**SC1** if accurate and not ruled |
| **(iii)** | 52 or 53 or 54 | **B1** | Must be integer<br>**[11]** |

| | | | |
|---|---|---|---|
| **14 (a)** |  <br>$y = 2x$ through (0, 0) and (5, 10)<br>$x + y = 10$ through (10, 0) and (0, 10)<br>$2x + y = 10$ through (5, 0) and (0, 10) | **L1**<br>**L1**<br>**L1** | Each straight line ruled<br>Max 2 if not ruled<br>Allow 2 mm accuracy at points indicated |
| **(b)** | Correct region unshaded ft | **B1 ft** | Allow indication by label *T* if clear<br>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<br>2, 7 ft | **B1 ft**<br>**B1 ft** | ft their *T*. Only full ft solutions and at least 2 pairs score **B2** ft.<br>Treat as ordered pairs unless labelled $x = .. , y = ….$<br>**SC1** if all reversed<br>**[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<br>$360(x + 8) – 360x = 16x(x + 8)$ oe<br><br>$360x + 2880 – 360x = 16x^2 + 128x$<br>$16x^2 + 128x – 2880 = 0$<br>$x^2 + 8x – 180 = 0$ | **M2**<br>**M1**<br><br>**E1** | **SC1** for sign errors<br>Dep on **M2** or **SC1**, for correctly putting all three terms over common denominator or multiplying throughout by $x$ and $x + 8$.<br>Dependent on **M2 M1**.<br>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<br>**[11]** |