

MARK SCHEME for the May/June 2013 series

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

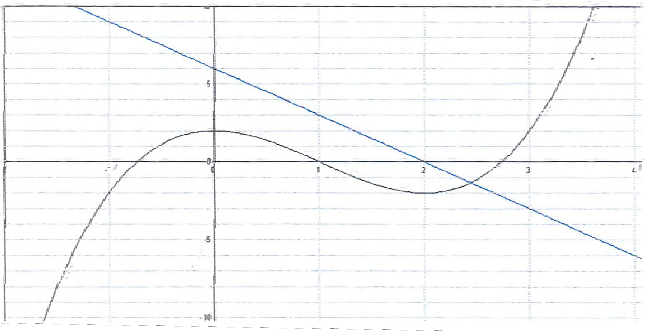
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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| <p>1 (a) (i) \$18 000</p> <p>(ii) \$10 800 or 10790 to 10800</p> <p>(iii) 2020</p> <p>(b) 18.2 or (18.15 to 18.16)</p> | | <p>3</p> <p>3</p> <p>2</p> <p>4</p> | <p>M2 for $15840 \div 0.88$ o.e. or M1 for $15840 = 88\%$ seen</p> <p>M2 for 15840×0.88^3 or <i>their</i> (i) $\times 0.88^4$ or M1 for 15840 (or 18000) $\times 0.88^n$, $n > 1$</p> <p>M1 for multiplying by 0.88, 3 more times or $15840 \times 0.88^n = 5000$ o.e. soi by 9.02 or 5010 to 5014 or 4410 to 4413 or SC1 for 2021.</p> <p>M3 for $(20000 \div 15 \times 0.68 + 950 + 1020) \div 15840$ soi by figs 18159 to 18161 M2 for $20000 \div 15 \times 0.68 + 950 + 1020$ (2876 to 2877) M1 for $20000 \div 15 \times 0.68$ (906 to 907)</p> |
| <p>2 (a) Reflection $y = -x$ o.e.</p> <p>(b) (i) Triangle vertices (3, -1), (5, -1), (5, -2)</p> <p>(ii) Triangle vertices (0, -2), (4, -2), (4, -4)</p> <p>(iii) Enlargement s.f.-2 centre (2, 0)</p> | | <p>1</p> <p>1</p> <p>2</p> <p>2FT</p> <p>1</p> <p>1</p> <p>1</p> | <p>Second transformation loses all marks</p> <p>Independent</p> <p>B1 for 2 vertices correct or rotation 180° about other centre</p> <p>B1 FT for 2 vertices correct or enlargement s.f. 2 correct orientation</p> <p>Second transformation loses all marks</p> <p>All independent</p> |

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| <p>3 (a)</p>  <p>(b) -0.732 or -0.7321 to -0.7320, 1, 2.73 or $2.732\dots$</p> <p>(c) (i) $(0, 2)$, $(2, -2)$</p> <p>(ii) $-2 < k < 2$</p> <p>(d) Sketch of line Indication that it only cuts curve once</p> | | <p>2</p> <p>2</p> <p>2</p> <p>2FT</p> <p>1</p> <p>1</p> | <p>B1 for correct cubic shape B1 for max on $x = 0$ and 2 +ve x- intercepts</p> <p>B1 for any one solution</p> <p>B1 for each</p> <p>FT (c)(i) Allow $-2 < k$ and $k > 2$ full marks SC1 for $-2 \leq k \leq 2$ or better or in words</p> |
| <p>4 (a) $30/\cos 65 = 70.986\dots$ (Answer Given)</p> <p>(b) $\sqrt{(70.99^2 + 20^2 - 2 \times 70.99 \times 20 \times \cos 115)}$</p> <p>81.5 or 81.48 to 81.50</p> <p>(c) 457 or 457.3 to 457.5</p> <p>(d) 64.3 or 64.4 or 64.33 to 64.36...</p> <p>(e) 1790 or 1800 or 1790 to 1796 www2</p> | | <p>2</p> <p>M2</p> <p>A1</p> <p>1FT</p> <p>2</p> <p>2FT</p> | <p>M1 for $\cos 65 = 30/QC$ o.e. If using Pythagoras must reach <i>their</i> $PC^2 + 30^2$</p> <p>Allow correct use of cosine rule in other triangles for M2 or M1 M1 for $(70.99^2 + 20^2 - 2 \times 70.99 \times 20 \times \cos 115)$</p> <p>If 0 scored SC1 for answer in range without Cosine rule</p> <p>FT $212.97 + 3 \times \text{their (b)}$.</p> <p>M1 for $\tan 65 = x/30$ o.e. (M mark may be seen earlier)</p> <p>FT for $\frac{1}{2} \times [\text{their (d)(i)}]^2 \times \sin 120$ o.e. M1 FT for $\frac{1}{2} \times [\text{their (d)(i)}]^2 \times \sin 120$ o.e.</p> |

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| <p>5 (a)</p> <p>Line from (0, 15) to (6, 0) (if extended) $x = 4$ drawn Line from (0, 12) to (12, 0) (if extended) Region R clearly identified cao</p> <p>(b) (i) 7 cao</p> <p>(ii) 9 cao</p> | | <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> | <p>Lines must be long enough to define region</p> <p>B1 for line through either point with negative gradient.</p> |
| <p>6 (a)</p> <p>89.7 or 89.657 to 89.66</p> <p>(b) 71.7 or 71.8 or 71.72 to 71.76</p> <p>(c) 155 or 155.2 to 155.3</p> | | <p>3</p> <p>1FT</p> <p>5</p> | <p>M2 for $(50 - \frac{1}{2}\pi \times 3^2) \times 2.5$</p> <p>or $10 \times 2.5 \times 5 - \frac{1}{2}\pi \times 3^2 \times 2.5$</p> <p>or M1 for $\frac{1}{2}\pi \times 3^2$ or $10 \times 2.5 \times 5$</p> <p>FT for <i>their</i> (b) $\times 0.8$</p> <p>M1 for $2 \times 2 \times 2.5 + 10 \times 2.5$ o.e. (horizontal rectangles) (35)</p> <p>M1 for $2 \times 2.5 \times 5$ (vertical rectangles) (25)</p> <p>M1 for $10 \times 5 - \frac{1}{2} \times \pi \times 3^2$ o.e. or better (front face) (35.86 or 71.7)</p> <p>M1 for $\frac{1}{2}\pi \times 6 \times 2.5$ o.e. (arch) (23.56)</p> |

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| 7 | (a) (i) 38 (ii) 32 (b) (i) 33, 53, 85, 115 (ii) 8 points plotted Joined by smooth curve (iii) Comparison of speeds or spreads (ranges) Justification referring to median or inter-quartile range (iv) 59.1 or 59.05... (v) Bars of correct width Bars correct heights 3, 4, 3.2, 1.5 and 1.25 | 1 2 2 2FT 1FT 1 1 2 1 3 | M1 for clear reading off at 35 and 105 B1 FT for any 2 B1 FT for 5 or more correct All marks depend on frequencies increasing SC2 for comparison of speeds and spreads without reasons Mark the best provided there is no contradiction M1 for at least two midpoints (25, 35, 42.5, 47.5, 55, 70, 90) soi at least 2 correct products (150, 420, 637.5, 950, 1760, 2100, 2250) or total 8267.5 Allow freehand B2 for 4 correct or B1 for 2 correct SC3 for “correct” but interval 40 to 45 and 45 to 50 combined with height of 3.5 |
| 8 | (a) $\frac{42}{992}$ or 0.0423 or 0.04233 to 0.04234 o.e. (b) $\frac{112}{306}$ or 0.366 or 0.3660...o.e. (c) $\frac{490}{600}$ or 0.817 or 0.8166 to 0.8167 o.e. | 2 3 3 | In all parts accept decimal / % to 3sf but not ratios or words etc. M1 for $\frac{7}{32} \times \frac{6}{31}$ o.e. M2 for $\frac{4}{18} \times \frac{14}{17} + \frac{14}{18} \times \frac{4}{17}$ o.e. or M1 for one of above products M2 for $1 - \frac{11}{25} \times \frac{10}{24}$ o.e. M1 for 1 omitted product in $\frac{11}{25} \times \frac{14}{24} + \frac{14}{25} \times \frac{11}{24} + \frac{14}{25} \times \frac{13}{24}$ or for $\frac{11}{25} \times \frac{10}{24}$ alone |

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| <p>9 (a) (i)</p> <p>(ii)</p> <p>(iii)</p> <p>(b)</p> | <p>$R = \frac{0.2}{d^2}$ o.e.</p> <p>0.05</p> <p>0.224 or 0.2236... cao</p> <p>0.5</p> | <p>3</p> <p>1FT</p> <p>2</p> <p>2</p> | <p>k could be evaluated in part (ii)</p> <p>M1 for $R = \frac{k}{d^2}$ o.e.</p> <p>M1 for substituting 0.8, 0.5 into $R = \frac{k}{d^2}$ or $R = kd^2$ or $R = \frac{k}{d}$</p> <p>FT $R = \frac{k}{d^2}$ o.e. with incorrect k only</p> <p>M1 for substituting $R = 4$ into $R = \frac{k}{d^2}$ or $R = kd^2$ or $R = \frac{k}{d}$ with k numerical</p> <p>M1 for $R \div 4$ o.e.</p> |
| <p>10 (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> <p>(e)</p> <p>(f)</p> | <p>(1, 0)</p> <p>$x = -3$ $y = 1$</p> <p>$-\frac{1}{3} \leq f(x) < 1$</p> <p>Sketch of $-5 - 2x$ or formula after $2x^2 + 12x + 14$ o.e. -4.14 or -4.414 ... -1.59 or -1.586 to -1.585</p> <p>Correct sketch</p> | <p>3</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>M1</p> <p>B1</p> <p>B1</p> <p>2</p> | <p>Good sketch with no overlaps of asymptotes and no departing from asymptotes. Must have positive x intercept.</p> <p>B1 for left hand branch to left of $x = -3$ and above $y = 1$ (approx.)</p> <p>B1 for right hand branch to right of $x = -3$ and below $y = 1$ (approx.)</p> <p>Accept y, x etc. Condone 0.333... B1 for either inequality or $-\frac{1}{3} < f(x) \leq 1$</p> <p>Allow other correct sketch for o.e.</p> <p>B2 max if no sketch or method shown</p> <p>B1 for translation in x direction B1 for asymptote at $x = 0$</p> |

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| 11 (a) | Any 2 of $ABO = CDO$ (alt angles) $BAO = DCO$ (alt angles) $AOB = COD$ (vert opp angles) | 1 + 1 | B1 for any 2 pairs of angles identified without a reason |
| (b) | 10 | 2 | M1 for $CD/6 = 5/3$ o.e. |
| (c) (i) | $\frac{3}{5}$ o.e. | 1 | |
| (ii) | $\frac{9}{25}$ o.e. | 1 | |
| (iii) | $\frac{9}{64}$ o.e. | 1 | 0.141 or 0.1406... |
| 12 (a) | $\frac{5500}{x}$ | 1 | |
| (b) | $\frac{5500}{x+60}$ $\frac{5500}{x} - \text{their } \frac{5500}{x+60} = \frac{1}{2}$ o.e. $5500(x+60) - 5500x = \frac{1}{2}x(x+60)$ o.e. or better | B1 M1FT | FT their expressions |
| | $x^2 + 60x - 660\,000 = 0$ | M1FT | Only FT $\text{their } \frac{5500}{x+60} - \frac{5500}{x} = \frac{1}{2}$ or 30 o.e. or for common denominator or LHS resolved to a single fraction and equated to $\frac{1}{2}$ (allow 1 sign error) |
| (c) | $\frac{-60 \pm \sqrt{60^2 - 4(1)(-660\,000)}}{2}$ Or parabola sketched with one +ve and one -ve root 783 -843 | E1 | Established without any errors or omissions |
| (d) | 12 41 or 1242 | M1 B1 B1 3 | If B0 then SC1 for correct but both not rounded to nearest whole number 782.9 to 782.96, -842.9 to -842.96 M1 for $5500 \div \text{their } +ve x$ B1 for 0540 or 0940 + $\left(\frac{5500}{\text{their } x}\right)$ [in hrs mins] - 4 |