

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

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| 0580 MATHEMATICS | |
| 0580/41 | Paper 4 (Extended), maximum raw mark 130 |

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.

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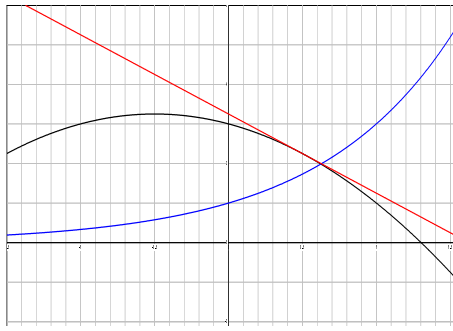
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Abbreviations

| | |
|-----|----------------------------|
| cao | correct answer only |
| cso | correct solution only |
| dep | dependent |
| ft | follow through after error |
| isw | ignore subsequent working |
| oe | or equivalent |
| SC | Special Case |
| www | without wrong working |
| art | anything rounding to |
| soi | seen or implied |

| Qu. | Answer | Mark | Part marks |
|------------------|-------------------------------------|-----------|--|
| 1 (a) (i) | [0]8 15 | 1 | |
| (ii) | $\frac{1.8}{27} \times 60 [= 4]$ oe | M2 | M1 for $\frac{1.8}{27}$ oe [0.0667 or better] |
| (b) (i) | 275 | 3 | M2 for $\frac{15-4}{4} \times 100$ or $\frac{15}{4} \times 100 - 100$ oe or M1 for $\frac{15-4}{4}$ or $\frac{15}{4} \times 100$ or oe 375 |
| (ii) | 73.3[3...] | 3 | M2 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ and $\frac{27 - \text{their } 7.2}{27} \times 100$ oe or M1 for $\frac{1.8}{15} \times 60 [=7.2 \text{ min}]$ or final answer of 26.6[6...] or 26.7 |
| (iii) | 25 | 2 | M1 for $\frac{9}{\text{figs } 36}$ oe |

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| Qu. | Answer | Mark | Part marks | |
|-------|--|---|---|---|
| 2 | (a) | 3, 0.33[3...], 1 | 3 | B1 for each correct value |
| | (b) | Correct quadratic curve | 3 | B2FT for 7 correct points or B1FT for 5 or 6 correct points |
| | | Correct exponential curve | 3 | B2FT for 7 correct points or B1FT for 5 or 6 correct points |
| | |  | | |
| | (c) (i) | Answer in range $1.2 < x < 1.4$ | 1 | |
| | (ii) | Answer in range $1.2 < x < 1.35$ | 1 | Not from a line other than $y = 4$ (± 1 mm) |
| (iii) | Answer in range $0.55 < x < 0.7$ | 1 | | |
| (d) | Correct tangent drawn And answer in range $-2.5 < m < -1.5$ | 3 | B1 for correct tangent at $x = 0.5$ B2 for answer in range dep on close attempt at tangent M1 for $[-] \frac{\text{rise}}{\text{run}}$ used with values soi from tangent, dep on close attempt at tangent or answer in range $1.5 < m < 2.5$ or SC1 for close attempt at tangent to exponential curve and answer in the range $1.6 < m < 2.2$ | |
| 3 | (a) (i) | 3.2 | 1 | |
| | (ii) | 4.2 | 1 | |
| | (iii) | 4.6 | 1 | |
| | (iv) | 196 | 1 | |
| | (b) (i) | 100, 46, 12 | 2 | B1 for 2 correct |
| | (ii) | 4 | 2 | M1 for frequency of 60 or 140 seen in workspace |

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| Qu. | Answer | Marks | Part marks | |
|-----------|--|--|--|---|
| 4 | (a) | | | |
| | | Enlargement | 1 | |
| | | [centre] $(-3, 4)$ | 1 | Do not allow column vector for coordinates |
| | | [scale factor] 3 | 1 | |
| | (b) (i) | Image at $(1, 5), (4, 5), (4, 6), (1, 7)$ | 2 | |
| | (b) (ii) | Image at $(5, 1), (8, 1), (8, 3), (5, 2)$ | 2 | SC1 for reflection in $y = 2$ |
| (b) (iii) | Image at $(-4, 3), (-1, 3), (-1, 6), (-4, 9)$ | 2 | SC1 for three correct vertices or shape with vertices at $(-4, 1)$ and $(-1, 1), (-1, 4)$ and $(-4, 7)$ | |
| (b) (iv) | $\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$ | 2 | SC1 for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}, k \neq \pm 1$ or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ | |
| (c) | Reflection $y = x$ oe | 2 | B1 B1 independent | |
| 5 | (a) | 171.25 (or 171 or 171.2 or 171.3) www | 3 | M1 for $5 \times 155 + 9 \times 162.5 + 18 \times 172.5 + 10 \times 185 [= 7192.5]$ and M1 (dep on M1) for <i>their</i> $\Sigma fx \div 42$ |
| | (b) | $160 < x \leq 165$ oe | 1 | |
| | (c) | Blocks with heights of 1.8, 1.2, 1, with correct interval widths and no gaps | 4 | B3 for 2 correct blocks or B2 for 1 correct block or B1 for 3 correct frequency densities or heights or 3 correct widths |

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| Qu. | Answer | Marks | Part marks |
|---------|--|----------|---|
| 6 (a) | 31.4 | 3 | M2 for $\frac{15.7}{\sin 30}$ or M1 for correct implicit statement |
| (b) | $[\sin E =] \frac{15.7 \times \sin 52}{16.5}$ 48.573... | M2 A1 | M1 for correct implicit statement |
| (c) (i) | $[\angle ACE =] 180 - 52 - 48.57$ [= 79.43] | M1 | |
| (ii) | $[\angle ECD =] 40.57...$ 15.3 or 15.27 to 15.281 www | A1 4 | M2 for $[(DE)^2 =] 16.5^2 + 23.4^2 - 2 \times 16.5 \times 23.4 \cos(40.6 \text{ or } 40.57)$ or M1 for full correct implicit statement A1 for 233 to 234 |
| (d) | 466 or 466.34 to 466.5 | 4 | M1 for $0.5 \times 15.7 \times \text{their } 31.4 \sin(90 - 30)$ oe M1 for $0.5 \times 15.7 \times 16.5 \sin(128 - \text{their } 48.6 \text{ or } 48.57)$ oe M1 for $0.5 \times 16.5 \times 23.4 \sin(40.6 \text{ or } 40.57)$ oe |

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| Qu. | Answer | Mark | Part marks |
|----------|---|------|---|
| 7 (a) | 6.61 (6.614...) www | 6 | <p>B1 for $\frac{x+2}{2x+3} = \frac{9}{16}$ oe</p> <p>M1 for $16(x+2) = 9(2x+3)$ or better</p> <p>A1 for $[x =] 2.5$</p> <p>M2 for $\sqrt{\{(2 \times \text{their } x + 3)^2 - (\text{their } x + 2)^2\}}$ or M1 for $(2 \times \text{their } x + 3)^2 - (\text{their } x + 2)^2$ or SC2 for final answer of $4\sqrt{13}$ or $\frac{7\sqrt{15}}{2}$ or better</p> <p>SC1 for final answer of $5\sqrt{7}$ or better</p> |
| (b) (i) | White = 8.5, red = 11 | 5 | <p>B3 for $7w + 5(w + 2.5) = 114.5$ or for $7(r - 2.5) + 5r = 114.5$ oe</p> <p>B1 for 8.5 or 11 or SC2 for $7w + 5 \times w + 2.5 = 114.5$ leading to 9.33[3...] or SC1 for $7w + 5 \times w + 2.5 = 114.5$</p> <p>OR</p> <p>B1 for $r = w + 2.5$ oe B1 for $7w + 5r = 114.5$ oe M1 for elimination of a variable A1 for 8.5 or 11</p> |
| (ii) (a) | $\frac{42}{132}$ or $\frac{21}{66}$ or $\frac{14}{44}$ or $\frac{7}{22}$ (0.318 or 0.3181 to 0.3182) | 2 | <p>M1 for $\frac{7}{12} \times \frac{6}{11}$</p> |
| (ii) (b) | $\frac{70}{132}$ or $\frac{35}{66}$ (0.53[0] or 0.5303...) | 3 | <p>M2 for $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11}$ or $1 -$ <i>their</i> (a) $-\frac{5}{12} \times \frac{4}{11}$ or M1 for $\frac{7}{12} \times \frac{5}{11}$ or $\frac{35}{132}$ or SC1 for $\frac{70}{144}$ oe from replacement</p> |

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| Qu. | Answer | Mark | Part marks | |
|-----|---------|--|--|--|
| 8 | (a) (i) | 118 | M1 for $(3 \times 180 - 2 \times 110 - 84) \div 2$ or better | |
| | (ii) | 31 | 1FT FT $(180 - \text{their (i)}) \div 2$ | |
| | (iii) | 22 | 1FT FT $84 - 2 \times \text{their (ii)}$ or $2 \times \text{their (ii)} - 40$, only if positive answer and less than 84 | |
| | (b) | 32 | 4 B2 for $360 - 3y = 2(4y + 4)$ oe and B1 for $11y = 352$ oe or M1 for angle at centre = $2 \times$ angle at circumference soi | |
| | (c) (i) | Opposite angles [cyclic quad] add to 180 | 1 | |
| | (ii) | 68 | 3 | M1 for [angle $PRS =$] $102 \div 3 \times 2$ and M1 for angle $PQS =$ angle PRS or angle $PRQ =$ angle PSQ |
| (d) | 5.75 | 3 | M2 for $6.9 \times \sqrt{\frac{5}{7.2}}$ oe or M1 for evidence of ratio of areas = $(\text{ratio of sides})^2$ or sf = 1.2 | |
| 9 | (a) | $\frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-3)}}{2}$ -2.30, 1.30 final answer | 2 B1 for $\sqrt{1^2 - 4 \times 1 \times (-3)}$ or better and if in the form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ then B1 for $p = -1$ and $r = 2(1)$ or better B1 B1 SC1 for -2.30 and 1.30 seen or -2.3 or -2.303 to -2.302 and 1.3 or 1.302 to 1.303 or final answer -1.30 and 2.30 | |
| | (b) | 4, 30, 53 | 3 M1 for $(2x + 7)^2 + (2x + 7) - 3$ and B1 for $(2x + 7)^2 = 4x^2 + 14x + 14x + 49$ oe | |

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| Qu. | Answer | Mark | Part marks |
|---------|---|------|--|
| (c) | $\frac{x-7}{2}$ | 2 | M1 for $y-7=2x$ or $x=2y+7$ or $-y+7=2x$ then $\div 2$ clearly seen in correct order with arrow or better or $\frac{y-7}{2}$ |
| (d) | -2 | 1 | |
| (e) | 1.158×10^{77} | 4 | B3 for 1.16×10^{77} or $1.1579... \times 10^{77}$ or 1.157×10^{77} or B2 for 2^{256} seen or B1 for 2^8 seen or 256 |
| 10 (a) | 50, 70 | 1 | |
| | $10n$ oe | 1 | |
| | 51, 71 | 1 | |
| | $10n+1$ oe | 1 | |
| (b) (i) | 212 | 1 | |
| (ii) | $20n+12$ | 1 | |
| (iii) | $20n+152$ | 1 | |
| (c) (i) | $5 \times 3^2 + 6 \times 3 = 63$ | 1 | |
| | and $11 + 21 + 31 = 63$ | | |
| | or $32 + 31 = 63$ or $11 + 52 = 63$ | 1 | |
| (ii) | 560 | 1 | |
| (d) | Complete solution with no errors seen and a conclusion e.g. $5n^2 + 6n + 10(n+1) + 1$ $= 5n^2 + 6n + 10n + 10 + 1$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5n^2 + 10n + 5 + 6n + 6$ $= 5(n+1)^2 + 6(n+1)$ | 4 | B1 for $5n^2 + 6n + 10n + 10 + 1$ or better B1 for use of $5(n+1)^2 = 5n^2 + 10n + 5$ oe at any stage B1 for use of $6n + 6 = 6(n+1)$ oe at any stage |