

MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers

0580 MATHEMATICS

0580/43

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

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

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

| | | | |
|---------------|---------------------------------------|-----------------|--------------|
| Page 2 | Mark Scheme: Teachers' version | Syllabus | Paper |
| | IGCSE – May/June 2012 | 0580 | 43 |

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 |

| | | | |
|------------------|--|------------------------|---|
| 1 (a) (i) | [0]5 38 oe | 1 | Allow 5h 38 but not 5h 38mins |
| | (ii) 92.7 [92.72 to 92.73] oe | 2 | Allow $92\frac{8}{11}$ or $\frac{1020}{11}$ M1 for $850 \div$ their 9 h 10 min in hours oe Allow $850 \div 9.1$ for M1 |
| | (b) (i) 204 or 203. 9[0] to 203.91 | 3 | M1 for $160 \times 255 + 330 \times 190 + 150 \times 180$ [130 500] M1 dep for $\div 640$ |
| | (ii) $640 \div (4 + 3 + 1)$ $\times 3 [= 240]$ | M1 M1 | [Can be in either order or shown together] Accept $240 \div 3 \times (4 + 3 + 1) = 640$ for M2 |
| | (iii) 150 www 3 | 3 | M2 for $240 \div 1.6$ oe or M1 for recognition of $240 = 100 + 60 \%$ |
| | (c) 11 cao www 3 | 3 | M1 for figs 340 or figs $550 \div$ speed [e.g. figs 188, figs 306] – can be spoiled by further work and M1 for correct conversion of units to give answer in seconds e.g. speed = 50 m/s M's independent |

| Page 3 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | |
|--|--|---|--|
| <p>2 (a)</p> <p>$[\sin =] \frac{10 \sin 95}{12}$ 56.1 (56.11 to 56.12) www 3</p> <p>(b)</p> <p>$12^2 + 17^2 - 2 \times 12 \times 17 \cos 30$ oe 8.93 [8.925....] www 4</p> <p>(c) (i)</p> <p>126 or 126.1 (126.11 to 126.12)</p> <p>(ii)</p> <p>306 or 306.1 (306.11 to 306.12)</p> <p>(d)</p> <p>$[\sin =] \frac{17 \sin 30}{\text{their}(b)}$ oe or $[\cos =] \frac{12^2 + (\text{their}(b))^2 - 17^2}{2 \times 12 \times \text{their}(b)}$ oe 180 – 95 – their (a)</p> <p>137 [136.5 to 136.9] www 4</p> | | <p>M2</p> <p>A1</p> <p>M2</p> <p>A2</p> <p>1ft</p> <p>1ft</p> <p>M2</p> <p>M1</p> <p>M1</p> <p>A1</p> | <p>M1 for correct implicit equation</p> <p>M1 for correct implicit equation A1 for 79.66 to 79.67 or 79.7</p> <p>ft their (a) + 70 [provided less than 360]</p> <p>ft 180 + their (c)(i) [provided less than 360]</p> <p>M1 for correct implicit equation [107.7 to 107.9 or 108 or 72 or 72.1 to 72.3]</p> <p>e.g. 28.88 to 28.9 seen – may be on diagram <u>Alt methods possible</u> e.g. $[\sin ABC =] \frac{12 \sin 30}{\text{their}(b)}$ [42.2...] gets M1 then 360 – 95 – 30 – their (a) – their 42.2 gets M2 dep on previous M1</p> <p>A1 isw reflex angle 223 or 223.1 to 223.5 after correct answer seen</p> |
| <p>3 (a)</p> <p>Triangle with vertices (6, 4), (9, 4), (9, 6)</p> <p>(b)</p> <p>Triangle with vertices (11, 1), (8, 1), (8, 3)</p> <p>(c) (i)</p> <p>Rotation 90° [anticlockwise] oe [centre] (0, 0) oe</p> <p>(ii)</p> <p>$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$</p> <p>(d) (i)</p> <p>Triangle with vertices (1, 3), (4, 3), (4, 9)</p> <p>(ii)</p> <p>$\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$</p> | | <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> | <p>Ignore labels and condone good freehand in parts (a), (b) and (d)(i)</p> <p>SC1 for translation $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$</p> <p>SC1 for reflection in $y = 6$</p> <p>If other transformations in addition, then 0, 0, 0 e.g. O, origin</p> <p>B1 each column</p> <p>SC1 for (1, 3) and (4, 3), or (4, 9)</p> <p>B1 right-hand column or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$</p> |

| Page 4 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | | |
|---|---------|--|-----|---|
| 4 | (a) (i) | Median = 2 www 2 | 2 | M1 for identifying mid-value [e.g. List with indication or 10 th and 11 th seen in working] or 10.5 soi |
| | | Mode = 3 | 1 | |
| | (ii) | 54 www 2 | 2 | M1 for $3 \div 20 \times 360$ oe |
| | (b) | 184 www 4 | 4 | M1 for 175, 185, 195 soi M1 for $5 \times a + 12 \times b + 3 \times c$ where a, b, c are in correct interval, including boundaries [3680] M1 (dep on 2 nd M) $\div 20$ |
| 5 | (a) (i) | 980 (979.6 to 980.3....) www 4 | 4 | M3 for $(\pi \times 8^2 \times 6) - \left(2 \times \frac{4}{3} \times \pi \times 3^3\right)$ Or M1 for $\pi \times 8^2 \times 6$ and M1 for $\left[2 \times \frac{4}{3}\right] \times \pi \times 3^3$ |
| | (ii) | 0.98[0] (0.9796 to 0.9803...) | 1ft | ft their (i) $\div 1000$ but not in terms of π |
| | (b) | 1.2[0] (1.195 to 1.196) | 2ft | ft their (a)(i) $\times 1.22 \div 1000$ or their (a)(ii) $\times 1.22$ SC1ft for figs 12[0] or 1195 to 1196 Apply ft to SC |
| | (c) | 4.88 or 4.87 (4.871 to 4.878..) www 2 | 2ft | ft their (a)(i) $\div \pi 8^2$ provided their (a)(i) is not 384π or 1206... M1 for their (a)(i) $\div \pi 8^2$ |

| | | | |
|--------|--------------------------------|----------|-------|
| Page 5 | Mark Scheme: Teachers' version | Syllabus | Paper |
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | | |
|---|---------|--------------------------|---|--|
| 6 | (a) (i) | 180 | 1 | |
| | (ii) | 20 | 1 | |
| | (b) | 220 | 1 | |
| | (c) (i) | $\frac{170}{240}$ oe isw | 1 | Allow 0.708, 0.7083... or % equivalents |
| | (ii) | $\frac{150}{240}$ oe isw | 1 | Allow 0.625 or % equivalents |
| | (d) | | | Penalise once for first correct none 4 dp dec answer to at least 3sf or correct fraction answer in parts (d) and (e) |
| | (i) | 0.5617 | 2 | Accept 56.1715% , do not accept 0.562 ww M1 for $\frac{180}{240} \times \frac{179}{239}$ [0.56171 to 0.56172], $\frac{537}{956}$ oe |
| | (ii) | 0.3766 | 3 | Accept 37.6569% M2 for $2 \times \frac{180}{240} \times \frac{60}{239}$ oe [0.37656 to 0.37657] $\frac{90}{239}$ oe Or M1 for one correct product seen, implied by 0.18828... or 0.1883 |
| | (e) | 0.6937 | 3 | Accept 69.3669%, do not accept 0.694 ww M2 for $\frac{150}{180} \times \frac{149}{179}$ [0.69366 to 0.69367] $\frac{745}{1074}$ oe or M1 for $\frac{150}{180}$ oe soi |

| | | | |
|---------------|---------------------------------------|-----------------|--------------|
| Page 6 | Mark Scheme: Teachers' version | Syllabus | Paper |
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | |
|----------------|--|-------------------------------------|--|
| 7 (a) | 1,, 11.3[1..], 16 | 3 | B1 each |
| (b) | 9 points plotted Smooth curve through at least 8 points and exponential shape | P3ft C1ft | P2ft for 7 or 8, P1ft for 5 or 6. ft only if correct shape and covers the domain $0 < x < 4$ |
| (c) | $2.3 < x < 2.35$ | 1 | |
| (d) | $0.4 < x < 0.5$, $3.25 < x < 3.35$ | M1 A1 A1 | $y = 3x$ ruled to cut curve at all possible points. |
| (e) | Reasonable tangent with gradient 3 (their x , their y) | M2 A1 | Or M1 for any tangent Dep on M2 . Their point of contact |
| 8 (a) | $u = 24$ $v = 92$ $w = 184$ | 2 1 1ft | SC1 for angle $DBA = 88$ or $u = \text{angle } CDY$ ft $2 \times$ their v Allow all seen in diagram |
| (b) | 10.8 | 2 | M1 for area factor of 3^2 soi e.g. dividing by 9 |
| (c) (i) | 18 | 2 | M1 for $4x + x = 90$ or better |
| (ii) | 72 | 2ft | ft $90 - \text{their } x$ or $4 \times \text{their } x$ |
| (iii) | 54 | 1 | M1 for angle K or $I = 90 - \text{their } x$ or $4 \times \text{their } x$ Allow all seen in diagram |

| Page 7 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | | |
|----|---------|---|------------------------|---|
| 9 | (a) (i) | $-\frac{1}{3}$ oe | 2 | B1 for $f(2) = -3$ soi |
| | (ii) | -7 | 1 | |
| | (b) | $\frac{x-2}{x}$ final answer www | 2 | M1 for $1 - \frac{2}{x}$ seen |
| | (c) | $y - 1 = x^3$ or $x = y^3 + 1$ $x = \sqrt[3]{y-1}$ or $x - 1 = y^3$ $\sqrt[3]{x-1}$ oe final answer www2 | M1 A1 | i.e. two correct steps For M1 , accept a correct reverse flowchart After 0 scored allow SC1 for $\sqrt[3]{x-1}$ seen then spoil |
| | (d) | A, F, D | 3 | B1 each |
| | (e) | 29 | 2 | M1 for $x = k(2)$ or $\sqrt[5]{x+3} = 2$ (Variable can be y in second method) |
| 10 | (a) | 1.3[0] | 3 | M2 for $(31.7[0] - 7) \div (12 + 7)$ or better Or M1 for $12x + 7(x + 1) = 31.7[0]$ or better or $31.7[0] - 7$ or better) |
| | (b) (i) | $\frac{36}{y} - \frac{36}{y+1} = 25$ oe $36(y+1) - 36y = 25y(y+1)$ oe $36y + 36 - 36y = 25y^2 + 25y$ oe } $25y^2 + 25y - 36 = 0$ | M2 E1 | SC1 for $\frac{36}{y}$ oe or $\frac{36}{y+1}$ oe seen Accept both all over $y(y+1)$ Must see at least one of these lines before E mark Final line reached without any errors or omissions |
| | (ii) | $(5y+9)(5y-4)$ | 2 | Accept $(25y-20)(y+1.8)$ oe SC1 for $(5y+m)(5y+n)$ where $mn = -36$ or $m+n = 5$ |
| | (iii) | -1.8 oe, 0.8 oe | 1ft | ft only SC1 from (b)(ii) |
| | (iv) | 2.6[0] | 1ft | ft $2 \times$ positive root from (b)(iii) +1 Dep on pos and neg root in (b)(iii) |

| | | | |
|---------------|---------------------------------------|-----------------|--------------|
| Page 8 | Mark Scheme: Teachers' version | Syllabus | Paper |
| | IGCSE – May/June 2012 | 0580 | 43 |

| | | | |
|----------------|--|----------------------------------|--|
| 11 (a) | 33, 41 16 π , 25 π 20 π , 30 π | 1 1 2 | |
| (b) (i) | 8n + 1 oe final answer | 2 | e.g. 9 + 8(n - 1), condone n = 8n + 1 SC1 for 8n + k |
| (ii) | 137 www2 | 2 | M1 for their (b)(i) = 1097 |
| (c) (i) | n ² π oe final answer | 1 | |
| (ii) | 9n ² π oe final answer | 1 | Allow (3n) ² π |
| (d) | n(n + 1) π oe final answer | 2 | SC1 for a quadratic expression e.g. n(n + 1), n ² + 5, n ² + n π |