

**MARK SCHEME for the October/November 2010 question paper
for the guidance of teachers**

0580 MATHEMATICS

0580/43

Paper 4 (Extended), maximum raw mark 130

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| | | | |
|---------------|---------------------------------------|-----------------|--------------|
| Page 2 | Mark Scheme: Teachers' version | Syllabus | Paper |
| | IGCSE – October/November 2010 | 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 |

| Qu. | Answers | Mark | Part Marks |
|----------|---|----------------------------|---|
| 1 | (a) $200 \div 10 \times 3$ oe $200 \div 10 \times 2$ oe | M1 M1 | |
| | (b) 65 | 2 | M1 for $\frac{39}{60} \times 100$ oe 35 is M0 |
| | (c) 46 | 3 | M2 for $36.80 \div 0.8$ oe or M1 for $80\% = 36.80$ oe |
| | (d) 0.6(0) | 3 | M2 for $5(x + 12) + 2x = 64.2$ oe or $(64.2 - 5 \times 12) \div 7$ or $5x + 2(x - 12) = 64.2$ oe or $(64.2 + 2 \times 12) \div 7$ or M1 for $y = x + 12$ and $5y + 2x = 64.2$ or $y = x - 12$ and $5x + 2y = 64.2$ After M0 , SC1 for $k(x \pm 12)$ seen |
| 2 | (a) $(\cos Q =) \frac{4^2 + 4.5^2 - 7^2}{2 \times 4 \times 4.5}$ o.e. 110.74.... | M2 E2 | M1 for $7^2 = 4^2 + 4.5^2 - 2 \times 4 \times 4.5 \times \cos(Q)$ If E0 then A1 for $-0.354(1\dots)$ |
| | (b) $(RS =) \frac{7 \sin 40}{\sin 85}$ 4.516 ... | M2 E1 | M1 for $\frac{RS}{\sin 40} = \frac{7}{\sin 85}$ o.e. Can be implied by second M |
| | (c) Angle $R = 55^\circ$ $0.5 \times 7 \times 4.52 \times \sin(\text{their } 55)$ o.e. $0.5 \times 4 \times 4.5 \times \sin 110.7$ o.e. Triangle PRS + Triangle PQR 21.4 (21.36 – 21.42) | B1 M1 M1 M1 A1 | (May be seen on diagram) $(12.95 - 13.0)$ their 55 is $(180 - 40 - 85)$ $(8.418 - 8.42)$ ($s = 7.75$) Dependent on M1, M1 www 5 |

| Page 3 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – October/November 2010 | 0580 | 43 |

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|---|--|--------------------------------------|--|
| 3 | <p>(a) $5x^2 - x$ or $x(5x - 1)$</p> <p>(b) $27x^9$</p> <p>(c) (i) $7x^7(1 + 2x^7)$</p> <p>(ii) $(y + w)(x + 2a)$</p> <p>(iii) $(2x + 7)(2x - 7)$</p> <p>(d) $\frac{-5 \pm \sqrt{5^2 - 4(2)(1)}}{2(2)}$ oe</p> <p>-2.28 -0.22</p> | 2 2 2 2 1 2 1 1 | <p>M1 for $x^2 + 3x$ or $4x^2 - 4x$ correct</p> <p>B1 for 27 or for x^9</p> <p>M1 for any correct partially factorised expression or $7x^7(1 + \dots)$</p> <p>M1 for $x(y + w) + 2a(y + w)$ or $y(x + 2a) + w(x + 2a)$</p> <p>In square root B1 for $5^2 - 4(2)(1)$ or better (17)</p> <p>If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$</p> <p>B1 for $p = -5$ and $r = 2(2)$</p> <p>SC1 for -2.3 or -2.281 to -2.280 and -0.2 or -0.220 to -0.219</p> |
| 4 | <p>(a) (i) $\begin{pmatrix} 25 \\ 43 \end{pmatrix}$</p> <p>(ii) (16)</p> <p>(iii) $\frac{1}{-2} \begin{pmatrix} 5 & -3 \\ -4 & 2 \end{pmatrix}$ isw or $\begin{pmatrix} \frac{5}{2} & \frac{3}{2} \\ 2 & -1 \end{pmatrix}$</p> <p>(b) Reflection only x-axis oe</p> <p>(c) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$</p> | 1 1 2 2 1 1 2 | <p>If 0, 0 then SC1 for 25 and 43 seen</p> <p>B1 for 16 without brackets</p> <p>B1 for determinant = -2</p> <p>or B1 for $k \begin{pmatrix} 5 & -3 \\ -4 & 2 \end{pmatrix}$</p> <p>If more than one transformation given – no marks available</p> <p>independent</p> <p>B1 for one correct column</p> |

| Page 4 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – October/November 2010 | 0580 | 43 |

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|---|---|--------------|--|---|
| 5 | (a) (i) Accurate perpendicular bisector, with 2 pairs of arcs, of CD . | 2 | SC1 if accurate without arcs. | |
| | (ii) Accurate angle bisector, with two pairs of arcs, of angle A . | 2 | SC1 if accurate without arcs. | |
| | (b) SHOP written in correct region | S1 | Dependent on at least SC1 in (i) and (ii) and intersection | |
| | (c) (i) Arc, centre B , radius 5cm, reaching across $ABCD$. | 1 | Allow good freehand | |
| | (ii) Area outside their arc centre B and outside SHOP shaded | 1ft | dep on S1 | |
| 6 | (a) (i) 33 | 1 | Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words i.s.w. incorrect cancelling/conversion to other forms Pen –1 once for 2 sf answers | |
| | (ii) $\frac{243}{3125}$ (0.07776) | 2 | | Accept 0.0778. M1 for $\left(\frac{3}{5}\right)^5$ oe |
| | (b) (i) $\frac{2}{5}, \frac{3}{4}, \frac{1}{8}, \frac{7}{8}$ | 3 | | B1 for $\frac{2}{5}$ and $\frac{3}{4}$ B1 for $\frac{1}{8}$ B1 for $\frac{7}{8}$ |
| | (ii) $\frac{1}{20}$ (0.05) cao | 2 | | M1 for their $\frac{2}{5} \times$ their $\frac{1}{8}$ |
| | (iii) $\frac{1}{5}$ (0.2) ft | 2ft | | ft $\frac{3}{20}$ + their (b)(ii) or M1 for $\frac{3}{5} \times \frac{1}{4}$ |
| 7 | (a) – 5.4 3.7 | 1 1 | P3ft their table. P2ft for 6 or 7 points. P1ft for 4 or 5 points Only ft points if shape not affected. | |
| | (b) 8 points correctly plotted ft Smooth cubic curve through all 8 points | P3 C1 | | |
| | (c) –2, –4, 4 | 2 | | B1 for 2 correct |
| | (d) 7 points correctly plotted ft Two separate smooth branches of rectangular hyperbola | P2 C1 | | P2ft P1ft for 5 or 6 points Must pass through all 7 points, only ft if shape not affected and no contact with either axis. |
| | (e) (i) $-2.9 \leq x \leq -2.8$ $2.05 \leq x \leq 2.15$ | 1 1 | | Not with y coordinates |
| | (ii) $a = 10$ $b = -40$ | 1 1 | | |

| Page 5 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – October/November 2010 | 0580 | 43 |

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| 8 | <p>(a) (i) 396 (395.6 – 396)</p> <p>(ii) 3.13 (3.125 – 3.128....) ft</p> <p>(iii) 144 (144 – 144.4) ft</p> <p>(b) (i) 311 (310.8 – 311.1)</p> <p>(ii) 3.50 (3.496 to 3.50) ft</p> | <p>4</p> <p>2ft</p> <p>2ft</p> <p>5</p> <p>2ft</p> | <p>M1 for $\frac{2}{3} \times \pi \times 3^3$ and M1 (independent) for $\pi \times 3^2 \times 12$,</p> <p>M1 (dependent on M2) for adding 126 π implies M3</p> <p>ft their (i) $\times 7.9 \div 1000$.</p> <p>M1 for $\times 7.9$ soi by figs 313 or 3125 – 3128...</p> <p>ft $15 \times 6 \times 6$ – their (a)(i)</p> <p>M1 for $6 \times 6 \times 15$ oe</p> <p>M1 for $2 \times \pi \times 3^2$ and M1 (independent) for $\pi \times 6 \times 12$ and M1 for $\pi \times 3^2$,</p> <p>M1 (dependent on M3) for adding. (99π implies M4)</p> <p>ft their (b)(i) $\times 0.01125$</p> <p>M1 for their (b)(i) $\div 8$ and \times figs 9 implied by figs 3496 to 350</p> |
| 9 | <p>(a) (i) $\begin{pmatrix} 9 \\ 5 \end{pmatrix}$</p> <p>(ii) $\begin{pmatrix} 4 \\ 7 \end{pmatrix}$</p> <p>(iii) \overrightarrow{BA} or $-\overrightarrow{AB}$</p> <p>(iv) 10.3 (10.29 – 10.30)</p> <p>(b) (i) $2\mathbf{u}$</p> <p>(ii) $\frac{1}{2}(\mathbf{t} - \mathbf{u})$ oe</p> <p>(iii) $\frac{3}{2}\mathbf{u} + \frac{1}{2}\mathbf{t}$ oe ft</p> | <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>2ft</p> | <p>If 0, SC1 for $\overrightarrow{CB} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ seen</p> <p>BA not indicated as a vector is not enough.</p> <p>M1 for (their 9)² + (their 5)²</p> <p>M1 for $\frac{1}{2}$ (their $\overrightarrow{BA} + \overrightarrow{AD} + \overrightarrow{DC}$) or equivalent</p> <p>correct route for \overrightarrow{BM}, along obtainable vectors in terms of \mathbf{t} and \mathbf{u}</p> <p>or M1 for correct unsimplified answer</p> <p>ft their (i) + their (ii) simplified</p> <p>or $\mathbf{t} + \mathbf{u}$ – their (b)(ii) simplified</p> <p>M1 for correct (or ft) unsimplified (i) + (ii)</p> <p>or $\mathbf{t} + \mathbf{u}$ – their (b)(ii)</p> |

| Page 6 | Mark Scheme: Teachers' version | Syllabus | Paper |
|--------|--------------------------------|----------|-------|
| | IGCSE – October/November 2010 | 0580 | 43 |

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| <p>10</p> | <p>(a) 7, 8, 8, 10, 11, 16 and 8, 8, 8, 10, 10, 16</p> <p>(b) (i) $(30 \times 65 + 35 \times 85 + 40 \times 95 + 40 \times 110 + 15 \times 135) \div 160$</p> <p>94.7 (94.68 – 94.69)</p> <p>(ii) Heights of 4, 2, 0.5 with correct interval widths</p> | <p>5</p> <p>4</p> <p>4</p> | <p>Mark answer spaces only or clearly indicated lists. Allow numbers in any order but must be lists of 6 integers B4 for either correct list If not B4 then B1 for a series with mode 8 and B1 for a series with median 9 and B1 for a series with sum 60</p> <p>M1 for mid-values soi (allow 1 error/omission) and M1 for use of $\sum fx$ with x in correct interval including both boundaries allow one further error/omission and M1 (dependent on second M) for $\div 160$ www 4</p> <p>B3 for 2 correct or B2 for 1 correct or B1 for all three freq. densities correct but no/incorrect graph</p> |
| <p>11</p> | <p>(a) 30 42 42 56 71 97</p> <p>(b) (i) 2550 (ii) 30</p> <p>(c) $(n + 1)(n + 2)$ oe final ans</p> <p>(d) (i) $2n^2 + pn + 1 = t$ Uses a value of n up to 6 and a matching t from the table e.g. puts $n = 3$ and $t = 31$ $2 \times 3^2 + 3p + 1 = 31$ M1</p> <p>OR Use $p = 4$ to get $2n^2 + 4n + 1 = 31$ and simplifies to 3 term eqn M1</p> <p>OR both $2 \times 9 + 4 \times 3 + 1 (= 31)$ M1 with one part evaluated</p> <p>OR $n(n + 1) + (n + 1)(n + 2) - 1$ or better M1</p> <p>(ii) 241 (iii) 12</p> <p>(e) $L = A + D - 1$ oe</p> | <p>4</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>3</p> <p>1</p> | <p>B3 for 2 correct rows or B2 for 1 correct row or B1 for any term in column 5 correct</p> <p>Correct solution shown with 1 intermediate step to $p = 4$ E1</p> <p>Solve correctly to get $n = 3$ E1</p> <p>Conclusion e.g. $31 = 31$ E1</p> <p>Correct simplification to $2n^2 + 4n + 1$ E1</p> <p>M1 for $2n^2 + 4n + 1 = 337$ and M1 for $(n - 12)(n + 14)$ or correct expression for n using formula</p> |