

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**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	<p>(a) $200 \div 10 \times 3$ oe $200 \div 10 \times 2$ oe</p> <p>(b) 65</p> <p>(c) 46</p> <p>(d) 0.6(0)</p>	<p>M1 M1</p> <p>2</p> <p>3</p> <p>3</p>	<p>M1 for $\frac{39}{60} \times 100$ oe 35 is M0</p> <p>M2 for $36.80 \div 0.8$ oe or M1 for $80\% = 36.80$ oe</p> <p>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</p>
2	<p>(a) $(\cos Q =) \frac{4^2 + 4.5^2 - 7^2}{2 \times 4 \times 4.5}$ o.e. 110.74....</p> <p>(b) $(RS =) \frac{7 \sin 40}{\sin 85}$ 4.516 ...</p> <p>(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)</p>	<p>M2</p> <p>E2</p> <p>M2</p> <p>E1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>M1 for $7^2 = 4^2 + 4.5^2 - 2 \times 4 \times 4.5 \times \cos(Q)$</p> <p>If E0 then A1 for $-0.354(1\dots)$</p> <p>M1 for $\frac{RS}{\sin 40} = \frac{7}{\sin 85}$ o.e.</p> <p>Can be implied by second M</p> <p>(May be seen on diagram)</p> <p>(12.95 – 13.0) their 55 is (180 – 40 – 85)</p> <p>(8.418 – 8.42) ($s = 7.75$)</p> <p>Dependent on M1, M1</p> <p>www 5</p>

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

<p>3</p>	<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>	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p>	<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>
<p>4</p>	<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>	<p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p>	<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

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

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

<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 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>