

**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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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

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<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</p> <p>or $\begin{pmatrix} \frac{5}{2} & \frac{3}{2} \\ 2 & -1 \end{pmatrix}$</p> <p>(b) Reflection only</p> <p>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>

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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	<p>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</p>	
	(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	<p>P3ft their table. P2ft for 6 or 7 points. P1ft for 4 or 5 points Only ft points if shape not affected.</p>	
	(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) $a = 10$	1		
	$b = -40$	1		

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<p>8</p>	<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>
<p>9</p>	<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 $(\text{their } 9)^2 + (\text{their } 5)^2$</p> <p>M1 for $\frac{1}{2}(\text{their } \overrightarrow{BA} + \overrightarrow{AD} + \overrightarrow{DC})$ 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 or $\mathbf{t} + \mathbf{u}$ – their (b)(ii) simplified</p> <p>M1 for correct (or ft) unsimplified (i) + (ii) or $\mathbf{t} + \mathbf{u}$ – their (b)(ii)</p>

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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 indicate 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 $\div 160$</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>