

**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
<b>1</b>	<p><b>(a)</b> <math>200 \div 10 \times 3</math> oe <math>200 \div 10 \times 2</math> oe</p> <p><b>(b)</b> 65</p> <p><b>(c)</b> 46</p> <p><b>(d)</b> 0.6(0)</p>	<p>M1 M1</p> <p>2</p> <p>3</p> <p>3</p>	<p><b>M1</b> for <math>\frac{39}{60} \times 100</math> oe 35 is <b>M0</b></p> <p><b>M2</b> for <math>36.80 \div 0.8</math> oe or <b>M1</b> for <math>80\% = 36.80</math> oe</p> <p><b>M2</b> for <math>5(x + 12) + 2x = 64.2</math> oe or <math>(64.2 - 5 \times 12) \div 7</math> or <math>5x + 2(x - 12) = 64.2</math> oe or <math>(64.2 + 2 \times 12) \div 7</math> or <b>M1</b> for <math>y = x + 12</math> and <math>5y + 2x = 64.2</math> or <math>y = x - 12</math> and <math>5x + 2y = 64.2</math> After <b>M0</b>, <b>SC1</b> for <math>k(x \pm 12)</math> seen</p>
<b>2</b>	<p><b>(a)</b> <math>(\cos Q =) \frac{4^2 + 4.5^2 - 7^2}{2 \times 4 \times 4.5}</math> o.e. 110.74....</p> <p><b>(b)</b> <math>(RS =) \frac{7 \sin 40}{\sin 85}</math> 4.516 ...</p> <p><b>(c)</b> Angle <math>R = 55^\circ</math> <math>0.5 \times 7 \times 4.52 \times \sin(\text{their } 55)</math> o.e. <math>0.5 \times 4 \times 4.5 \times \sin 110.7</math> o.e. Triangle <math>PRS</math> + Triangle <math>PQR</math> 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><b>M1</b> for <math>7^2 = 4^2 + 4.5^2 - 2 \times 4 \times 4.5 \times \cos(Q)</math></p> <p>If <b>E0</b> then <b>A1</b> for <math>-0.354(1\dots)</math></p> <p><b>M1</b> for <math>\frac{RS}{\sin 40} = \frac{7}{\sin 85}</math> 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) (<math>s = 7.75</math>)</p> <p>Dependent on M1, M1</p> <p>www 5</p>

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3	<p>(a) <math>5x^2 - x</math> or <math>x(5x - 1)</math></p> <p>(b) <math>27x^9</math></p> <p>(c) (i) <math>7x^7(1 + 2x^7)</math></p> <p>(ii) <math>(y + w)(x + 2a)</math></p> <p>(iii) <math>(2x + 7)(2x - 7)</math></p> <p>(d) <math>\frac{-5 \pm \sqrt{5^2 - 4(2)(1)}}{2(2)}</math> oe</p> <p>-2.28 -0.22</p>	2 2 2 2 1 2 1 1	<p><b>M1</b> for <math>x^2 + 3x</math> or <math>4x^2 - 4x</math> correct</p> <p><b>B1</b> for 27 or for <math>x^9</math></p> <p><b>M1</b> for any correct partially factorised expression or <math>7x^7(1 + \dots)</math></p> <p><b>M1</b> for <math>x(y + w) + 2a(y + w)</math> or <math>y(x + 2a) + w(x + 2a)</math></p> <p>In square root <b>B1</b> for <math>5^2 - 4(2)(1)</math> or better (17)</p> <p>If in form <math>\frac{p + \sqrt{q}}{r}</math> or <math>\frac{p - \sqrt{q}}{r}</math></p> <p><b>B1</b> for <math>p = -5</math> and <math>r = 2(2)</math></p> <p><b>SC1</b> for -2.3 or -2.281 to -2.280 and -0.2 or -0.220 to -0.219</p>
4	<p>(a) (i) <math>\begin{pmatrix} 25 \\ 43 \end{pmatrix}</math></p> <p>(ii) (16)</p> <p>(iii) <math>\frac{1}{-2} \begin{pmatrix} 5 &amp; -3 \\ -4 &amp; 2 \end{pmatrix}</math> isw or <math>\begin{pmatrix} \frac{5}{2} &amp; \frac{3}{2} \\ 2 &amp; -1 \end{pmatrix}</math></p> <p>(b) Reflection only x-axis oe</p> <p>(c) <math>\begin{pmatrix} 0 &amp; -1 \\ 1 &amp; 0 \end{pmatrix}</math></p>	1 1 2 2 1 1 2	<p>If 0, 0 then <b>SC1</b> for 25 and 43 seen</p> <p><b>B1</b> for 16 without brackets</p> <p><b>B1</b> for determinant = -2</p> <p>or <b>B1</b> for <math>k \begin{pmatrix} 5 &amp; -3 \\ -4 &amp; 2 \end{pmatrix}</math></p> <p>If more than one transformation given – no marks available</p> <p>independent</p> <p><b>B1</b> 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	<b>Accept</b> 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. <b>M1</b> for $\left(\frac{3}{5}\right)^5$ oe
	(b) (i) $\frac{2}{5}, \frac{3}{4}, \frac{1}{8}, \frac{7}{8}$	3		<b>B1</b> for $\frac{2}{5}$ and $\frac{3}{4}$ <b>B1</b> for $\frac{1}{8}$ <b>B1</b> for $\frac{7}{8}$
	(ii) $\frac{1}{20}$ (0.05) cao	2		<b>M1</b> 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 <b>M1</b> for $\frac{3}{5} \times \frac{1}{4}$
7	(a) – 5.4 3.7	1 1	<b>P3ft</b> their table. <b>P2ft</b> for 6 or 7 points. <b>P1ft</b> 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		<b>B1</b> for 2 correct
	(d) 7 points correctly plotted ft Two <b>separate</b> smooth branches of rectangular hyperbola	P2 C1		<b>P2ft</b> <b>P1ft</b> 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		

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

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