

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

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.

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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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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</p> <p>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>

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5	<p>(a) (i) Accurate perpendicular bisector, with 2 pairs of arcs, of CD.</p> <p>(ii) Accurate angle bisector, with two pairs of arcs, of angle A.</p> <p>(b) SHOP written in correct region</p> <p>(c) (i) Arc, centre B, radius 5cm, reaching across $ABCD$.</p> <p>(ii) Area outside their arc centre B and outside SHOP shaded</p>	<p>2</p> <p>2</p> <p>S1</p> <p>1</p> <p>1ft</p>	<p>SC1 if accurate without arcs.</p> <p>SC1 if accurate without arcs.</p> <p>Dependent on at least SC1 in (i) and (ii) and intersection</p> <p>Allow good freehand</p> <p>dep on S1</p>
6	<p>(a) (i) 33</p> <p>(ii) $\frac{243}{3125}$ (0.07776)</p> <p>(b) (i) $\frac{2}{5}, \frac{3}{4}, \frac{1}{8}, \frac{7}{8}$</p> <p>(ii) $\frac{1}{20}$ (0.05) cao</p> <p>(iii) $\frac{1}{5}$ (0.2) ft</p>	<p>1</p> <p>2</p> <p>3</p> <p>2</p> <p>2ft</p>	<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> <p>Accept 0.0778. M1 for $\left(\frac{3}{5}\right)^5$ oe</p> <p>B1 for $\frac{2}{5}$ and $\frac{3}{4}$ B1 for $\frac{1}{8}$ B1 for $\frac{7}{8}$</p> <p>M1 for their $\frac{2}{5} \times$ their $\frac{1}{8}$</p> <p>ft $\frac{3}{20}$ + their (b)(ii) or M1 for $\frac{3}{5} \times \frac{1}{4}$</p>
7	<p>(a) -5.4 3.7</p> <p>(b) 8 points correctly plotted ft Smooth cubic curve through all 8 points</p> <p>(c) -2, -4, 4</p> <p>(d) 7 points correctly plotted ft Two separate smooth branches of rectangular hyperbola</p> <p>(e) (i) $-2.9 \leq x \leq -2.8$ $2.05 \leq x \leq 2.15$</p> <p>(ii) $a = 10$ $b = -40$</p>	<p>1</p> <p>1</p> <p>P3</p> <p>C1</p> <p>2</p> <p>P2</p> <p>C1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>P3ft their table. P2ft for 6 or 7 points. P1ft for 4 or 5 points Only ft points if shape not affected.</p> <p>B1 for 2 correct</p> <p>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.</p> <p>Not with y coordinates</p>

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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) \vec{BA} or $-\vec{AB}$</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 $\vec{CB} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ 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 $\frac{1}{2}(\text{their } \vec{BA} + \vec{AD} + \vec{DC})$ or equivalent</p> <p>correct route for \vec{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>

