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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UNIVERSITY of CAMBRIDGE
International Examinations

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….)
	(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 $R = 55°$ $0.5 \times 7 \times 4.52 \times \sin(\text{their } 55)$ 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

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

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			**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
	(a) (i) 33	1	
	(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	1	
	3.7	1	
	(b) 8 points correctly plotted ft	P3	**P3ft** their table. **P2ft** for 6 or 7 points. **P1ft** for 4 or 5 points
	Smooth cubic curve through all 8 points	C1	Only ft points if shape not affected.
	(c) –2, –4, 4	2	**B1** for 2 correct
	(d) 7 points correctly plotted **ft**	P2	**P2ft P1ft** for 5 or 6 points
	Two **separate** smooth branches of rectangular hyperbola	C1	Must pass through all 7 points, only ft if shape not affected and no contact with either axis.
	(e) (i) $-2.9 \leqslant x \leqslant -2.8$	1	Not with *y* coordinates
	$2.05 \leqslant x \leqslant 2.15$	1	
	(ii) $a = 10$	1	
	$b = -40$	1	

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

10	**(a)** 7, 8, 8, 10, 11, 16 and 8, 8, 8, 10, 10, 16	5	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
	(b) (i) $(30 \times 65 + 35 \times 85 + 40 \times 95 + 40 \times 110 + 15 \times 135) \div 160$ 94.7 (94.68 – 94.69)	4	**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 ÷ 160 www 4
	(ii) Heights of 4, 2, 0.5 with correct interval widths	4	**B3** for 2 correct or **B2** for 1 correct or **B1** for all three freq. densities correct but no/incorrect graph
11	**(a)** 30 42 42 56 71 97	4	**B3** for 2 correct rows or **B2** for 1 correct row or **B1** for any term in column 5 correct
	(b) (i) 2550	1	
	(ii) 30	1	
	(c) $(n + 1)(n + 2)$ oe final ans	1	
	(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** **OR** Use $p = 4$ to get $2n^2 + 4n + 1 = 31$ and simplifies to 3 term eqn **M1** **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**	2	Correct solution shown with 1 intermediate step to $p = 4$ **E1** Solve correctly to get $n = 3$ **E1** Conclusion e.g. 31 = 31 **E1** Correct simplification to $2n^2 + 4n + 1$ **E1**
	(ii) 241	1	
	(iii) 12	3	**M1** for $2n^2 + 4n + 1 = 337$ and **M1** for $(n - 12)(n + 14)$ or correct expression for n using formula
	(e) $L = A + D - 1$ oe	1	