UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2008 question paper

0580 and 0581 MATHEMATICS

0580/04 and 0581/04   Paper 04 (Extended), maximum raw mark 130

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UNIVERSITY *of* **CAMBRIDGE**
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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

1	(a)	(i)	($) 6 000 cao	B2	M1 for 0.1 × 10 000 + 0.25 × 20 000 oe
		(ii)	15 (%) cao	B2	M1 for $\dfrac{their\,(a)(i)}{40000} \times 100$
	(b)		($) 11 200 ft	B1 ft	ft 17200 – *their* (a)(i)
	(c)	(i)	($) 7500 cao	B2	M1 for $\dfrac{12000}{5+3} \times 5$ oe After M0, SC1 for 4500
		(ii)	9/80 cao	B1	Ignore decimals or %'s seen Mark final fraction
	(d)		($) 8640 cao	B2	M1 for 10 800 ÷ 1.25 oe
					[10]

2	(a)	(i)	$x(x + 4) / 2 = 48$ oe $x^2 + 4x – 96 = 0$	M1 E1	Eqn must include 48 Dep on M1 + shows one intermediate algebraic step with no errors seen
		(ii)	– 12 or 8	B1B1	Allow deletion of negative root
		(iii)	12 (cm) correct or ft	B1ft	Accept 12 or ft their positive root in part (ii) (if only one) + 4.
	(b)		$\dfrac{4}{5}$ oe	B2	M1 for $\dfrac{x}{x+4} = \dfrac{1}{6}$ oe
	(c)	(i)	$(x + 4)^2 + x^2 = 9^2$ oe or $x^2 + 8x + 16 + x^2 = 81$ $2x^2 + 8x – 65 = 0$	M1 E1	Accept 2nd line for M1 or $2x^2 + 8x +16 = 81$ Dep on M1 with no errors, expanded brackets step needed
		(ii)	$\dfrac{p +(-)\sqrt{q}}{r}$ where $p = –8$ <u>and</u> $r = 2 \times 2$ and $q = 8^2 – 4(2)(–65)$ oe (584) – 8.04, 4.04 cao www	M1 M1 A1A1	Allow second mark if in form $p\pm\dfrac{\sqrt{q}}{r}$ SC2 if correct solutions but no working shown or SC1 for –8.041522987 and 4.041522987 rounded or truncated
		(iii)	21.08 or 21.1 (cm) strict ft	B1ft dep	ft 4.04 in part (ii) or 2 × a positive root + 13
					[14]

3	(a)	5.(04), 0(.0), 8.7 or 8.66(6…) or better seen	**B3**	**1** each	
	(b)	Correct axes for domain and range	**S1**		
		10 correct points, on correct grid line or within correct 2mm square vertically	**P3ft**	**P2ft** for 8 or 9 correct **P1ft** for 6 or 7 correct	
		Reasonable curve through 10 points condone curvature around $x = -0.2$ and 0.2	**C1ft**	Correct shape, not ruled, within 1 mm of points (curves could be joined)	
		Two separate branches	**B1ft**	Independent but needs two 'curves' on either side of y-axis	
	(c) (i)	$y = -3x$ ruled correctly	**L1**	Check at $(-1, 3)$ to $(1, -3)$ within 1 mm (can be shorter)	
		-2.95 to -2.6, -0.75 to -0.6, 0.5 to 0.6	**B2**	**B1** for 2 correct. isw y – values No penalty for each extra value if curve is cut more than 3 times	
	(ii)	$(a =) 3 \quad (b =) -1$	**B1B1**	After 0,0 **SC1** for $x^3 + 3x^2 - 1 = 0$	
	(d)	Tangent to their curve ruled at $x = -2$	**T1**	Must be a reasonable tangent allow slight daylight <1mm	
		rise/run using correct scales	**M1**	Dep on **T1** (implied by answer 3 to 4.5) Must show working if answer out of range	
		-4.5 to -3	**A1**		
					[17]

4	(a)	72	**B1**		
	(b) (i)	$0.5 \times 15 \times 15 \sin(\textit{their } 72)$ oe	**M1**	not for 90°	
		106.9 to 107 (cm^2) cso	**A1**	www2	
	(ii)	534.5 to 535 (cm^2) ft	**B1 ft**	ft *their* **(i)** × 5	
	(iii)	$\pi \times 15^2 \times 50$	**M1**	(707 or 35350) or $\pi \times 15^2$	
		their **(ii)** × 50	**M1**	(26750) or $\pi \times 15^2 - \textit{their }$ **(b) (ii)**	
		Vol of cylinder – prism	**M1**	Dep on **M2** then × 50	
		$8590 - 8625$ (cm^3) cao	**A1**	www4	
	(c)	$(AB =) 15\sin(\textit{their}36) \times 2$ oe (17.63) (not 30° or 45°)	**M1**	or $\sqrt{15^2 + 15^2 - 2 \times 15 \times 15 \times \cos(\textit{their}72)}$ Not for 90° or 60° or sine rule	
		Area of one rectangle = their $AB \times 50$	**M1**	dep on **1ˢᵗ M** (881.5) not 15×50	
		$5 (50 \times \text{a length}) + 2 \times \textit{their}$ **(b)(ii)**	**M1**	Indep (4407.5 + 1070)	
		$5470 - 5480$ (cm^2) cao	**A1**	www4	
					[12]

5	(a)	$(60 + 40)/35$ Correct method to convert a decimal time to minutes 14 46 or 2 46 pm cao	**M1** **M1** **A1**	$(2.857…)$ could be in parts ft a decimal either full answer or decimal part × 60 (e.g. 51.(428), 171.(4..)or 2hrs 51 or 51 m) www3
	(b) (i)	260	**B1**	
	(ii)	145	**B1ft**	ft *their* **(b) (i)** – 115
	(c)	$(AC^2 =)\ 40^2 + 60^2 - 2 \times 40 \times 60 \times \cos115$ $(AC=) \sqrt{}$ of a correct combination 85(.0 km) cao	**M2** **M1** **A1**	**M1** for correct implicit version dependent (7229) www4
	(d)	$\dfrac{\sin A}{60} = \dfrac{\sin115}{their(c)}$ oe $(\sin A =) \dfrac{\sin115}{their(c)} \times 60$ 39.76 to 39.8 cao	**M1** **M1** **A1**	Implicit equation Could use cosine rule M1 for implicit and M1 for explicit form Dep on **M1** Explicit equation www3
	(e)	40sin80 + 60sin35 oe (39.4) (34.4) 73.76 – 73.81 (km) cao	**M2** **A1**	*their* **(c)** × sin(100 – *their* **(d)**) **or** *their* **(c)** × cos (*their* **(d)** – 10) **M1** for either 40sin80 or 60sin35 or implicit trig version using *their* **(c)** www3
				[15]

6	(a) (i)	30	**B1**	
	(ii)	30, 30.5, 31	**B1 B1** **B1**	Penalty 1 for each extra value Ignore repeated values
	(iii)	$\dfrac{10 \times 30 + 7 \times 31 + x \times 32}{10 + 7 + x} = 30.65$ correct clearance of fraction 3 cao	**M1** **M1** **A1**	 Dep on **M1** e.g. $517 + 32x = 521.05 + 30.65x$ oe www3
	(b) (i)	$\dfrac{35 \times 15 + 115 \times 21 + 26 \times 23 + 24 \times 27}{200}$ 20.93 or 20.9 cao	**M3** **A1**	(4186/200) **M1** for use of 15, 21, 23, 27 (allow one error) and **M1** for use of $\sum fx$ with value of x in correct range used (allow one further error) and **M1** dep on **2ⁿᵈ M** for dividing by $\sum f$ or 200 www4 Accept 21 after **M3** earned
	(ii)	2.6 cao 0.7 and 0.8	**B1** **B4**	 **B3** for one correct or **B2** for 3.5 **and** 4 seen or **B1** for 4 seen
				[16]

7	(a)	(i)	Translation only $\begin{pmatrix} 0 \\ -11 \end{pmatrix}$ oe	**B1** **B1**	Throughout parts **(i)** to **(v)** if more than one transformation is given then no marks at all for that part Accept T
		(ii)	Reflection only $x = 1$ oe only	**B1** **B1**	Accept M
		(iii)	Reflection only $y = -x$ oe only	**B1** **B1**	Accept M
		(iv)	Enlargement only (centre)(2, 0), only (scale factor) 0.5 oe only	**B1** **B1** **B1**	Accept E
		(v)	Stretch only (factor) 2, only x-axis oe invariant cao only	**B1** **B1** **B1**	Accept S Ignore parallel to y-axis
	(b)	(i)	$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$	**B2**	**B1** each column
		(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$	**B2**	**B1** for right hand column **[16]**

8	(a)	$x = 78$ alternate angles either $y = 144$ or $z = 102$ (opposite angles of) cyclic quad (= 180) and $z = 102$ or $y = 144$ Angles (in **(a)**) quadrilateral (= 360) or (opp angles of) cyclic quad (= 180)	**B1** **R1** **B1** **R1** **B1** **R1**	Dep on **B1** Accept Z <u>angle</u>, extras can spoil Accept longer reasons using correct language and clarity with angles used. e.g. allied angles gives 102° and angles on a straight line = 180° Dep on **B1**, extras can spoil Dep on **B1** extras can spoil
	(b)	Their $z + 36 \neq 180$ oe	**R1**	Could also use their angles x and y provided $x + y \neq 180$. Could be a longer reason involving angles must be clearly explained.
	(c)	72 or 288	**B1**	
	(d)	51 cao	**B1**	**[9]**

9	(a)	$(p =)$ 5 cao, $(q =)$ 12 cao $(r =)$ 1 ft	B1 B1 B1ft	Accept in correct order if no labels ft for $r = 18 -$ *their p – their q* provided *r* not negative
	(b) (i)	17 cao	B1	
	(ii)	12 cao	B1	
	(c) (i)	26 cao	B1	
	(ii)	57 ft	B1ft	ft $45 +$ *their q*
	(d) (i)	$\dfrac{8}{100}$ oe isw	B1	
	(ii)	$\dfrac{45}{100}$ oe isw	B1	
	(e)	Any fraction with denominator 74 seen $\dfrac{37}{74} \times \dfrac{36}{73}$ $\dfrac{18}{73}$ oe isw cao	B1 M1 A1	ft *their* fraction i.e. one taken off each part $\dfrac{k}{l} \times \dfrac{k-1}{l-1}$ N.B $\dfrac{1}{2} \times \dfrac{36}{73}$ gets **B1M1** $\dfrac{1332}{5402}$ www3 (if decimal then 0.247 or better) Do not accept ratio or in words **[12]**

10	(a) (i)	$\dfrac{8 \times (8+1)}{2} = 36$ $1 + 2 + 3 + \ldots + 8 = 36$	E1 E1	
	(ii)	80 200	B1	
	(b) (i)	$2(1 + 2 + 3 + \ldots + n) =$ $2 \times \dfrac{n(n+1)}{2} = n(n+1)$	E1	both steps must be shown
	(ii)	40 200	B1	
	(iii)	40 000	B1ft	ft *their* **(a)(ii)** – *their* **(b)(ii)** or *their* **(b)(ii)** – 200 ft Not for zero or negative answer
	(c) (i)	$\dfrac{2n(2n+1)}{2}$ oe final answer	B1	e.g. $2n^2 + n$
	(ii)	n^2 cao	B2	**M1** for *their* **(c)(i)** $- n(n+1)$ or $n(n+1) - n$ or $n/2(2+2(n-1))$ **[9]**