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
International Examinations

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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

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1 (a) (i)	($) 6 000 cao	**B2**	**M1** for $0.1 \times 10\,000 + 0.25 \times 20\,000$ oe
(ii)	15 (%) cao	**B2**	**M1** for $\frac{\textit{their (a)(i)}}{40000} \times 100$
(b)	($) 11 200 ft	**B1 ft**	ft 17200 – *their* **(a)(i)**
(c) (i)	($) 7500 cao	**B2**	**M1** for $\frac{12000}{5+3} \times 5$ 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 $10\,800 \div 1.25$ 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)	$\frac{4}{5}$ oe	**B2**	**M1** for $\frac{x}{x+4} = \frac{1}{6}$ 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)	$\frac{p + (-)\sqrt{q}}{r}$ where $p = -8$ and $r = 2 \times 2$ and $q = 8^2 - 4(2)(-65)$ oe (584) – 8.04, 4.04 cao www	**M1** **M1** **A1A1**	Allow second mark if in form $p \pm \frac{\sqrt{q}}{r}$ **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]**

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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 10 correct points, on correct grid line or within correct 2mm square vertically Reasonable curve through 10 points condone curvature around $x = -0.2$ and 0.2 Two separate branches	**S1** **P3ft** **C1ft** **B1ft**	**P2ft** for 8 or 9 correct **P1ft** for 6 or 7 correct Correct shape, not ruled, within 1 mm of points (curves could be joined) Independent but needs two 'curves' on either side of y-axis
(c) (i)	$y = -3x$ ruled correctly –2.95 to – 2.6, – 0.75 to – 0.6, 0.5 to 0.6	**L1** **B2**	Check at (–1, 3) to (1, –3) within1 mm (can be shorter) **B1** for 2 correct. isw y – values No penalty for each extra value if curve is cut more than 3 times
(ii)	(a =) 3 (b =) –1	**B1B1**	After 0,0 **SC1** for $x^3 + 3x^2 - 1 = 0$
(d)	Tangent to their curve ruled at $x = -2$ rise/run using correct scales –4.5 to –3	**T1** **M1** **A1**	Must be a reasonable tangent allow slight daylight <1mm Dep on **T1** (implied by answer 3 to 4.5) Must show working if answer out of range **[17]**

4 (a)	72	**B1**	
(b) (i)	0.5 × 15 × 15 sin (*their* 72) oe 106.9 to 107 (cm^2) cso	**M1** **A1**	not for 90° www2
(ii)	534.5 to 535 (cm^2) ft	**B1 ft**	ft *their* **(i)** × 5
(iii)	$\pi \times 15^2 \times 50$ *their* **(ii)** × 50 Vol of cylinder – prism 8590 – 8625 (cm^3) cao	**M1** **M1** **M1** **A1**	(707 or 35350) or $\pi \times 15^2$ (26750) or $\pi \times 15^2$ – *their* **(b) (ii)** Dep on **M2** then × 50 www4
(c)	(AB =) 15sin(*their*36) × 2 oe (17.63) (not 30° or 45°) Area of one rectangle = their AB × 50 5 (50 × a length) + 2 × *their* **(b)(ii)** 5470 – 5480 (cm^2) cao	**M1** **M1** **M1** **A1**	or $\sqrt{15^2 + 15^2 - 2 \times 15 \times 15 \times \cos(\textit{their}\,72)}$ Not for 90° or 60° or sine rule dep on **1st M** (881.5) not 15 × 50 Indep (4407.5 + 1070) 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)	$(AC^2 =)\ 40^2 + 60^2 - 2 \times 40 \times 60 \times \cos 115$ $(AC=)\ \sqrt{}$ of a correct combination 85(.0 km) cao	**M2** **M1** **A1**	**M1** for correct implicit version dependent (7229) www4
(d)	$\frac{\sin A}{60} = \frac{\sin 115}{their\textbf{(c)}}$ oe $(\sin A =)\ \frac{\sin 115}{their\textbf{(c)}} \times 60$ 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)	$\frac{10 \times 30 + 7 \times 31 + x \times 32}{10 + 7 + x} = 30.65$ correct clearance of fraction 3 cao	**M1** **M1** **A1**	 Dep on **M1** e.g. $517 + 32x = 521.05 + 30.65x$ oe www3
(b) (i)	$\frac{35 \times 15 + 115 \times 21 + 26 \times 23 + 24 \times 27}{200}$ 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]**

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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)	$\frac{8}{100}$ oe isw	**B1**	
(ii)	$\frac{45}{100}$ oe isw	**B1**	
(e)	Any fraction with denominator 74 seen $\frac{37}{74} \times \frac{36}{73}$ $\frac{18}{73}$ oe isw cao	**B1** **M1** **A1**	ft *their* fraction i.e. one taken off each part $\frac{k}{l} \times \frac{k-1}{l-1}$ N.B $\frac{1}{2} \times \frac{36}{73}$ gets **B1M1** $\frac{1332}{5402}$ www3 (if decimal then 0.247 or better) Do not accept ratio or in words **[12]**

10 (a) (i)	$\frac{8 \times (8+1)}{2} = 36$ $1 + 2 + 3 + \ldots + 8 = 36$	**E1** **E1**	
(ii)	80 200	**B1**	
(b) (i)	$2\,(1 + 2 + 3 + \ldots + n) =$ $2 \times \frac{n(n+1)}{2} = n\,(n + 1)$	 **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)	$\frac{2n(2n+1)}{2}$ 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]**