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

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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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 $0.1 \times 10\,000 + 0.25 \times 20\,000$
(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)	$\frac{p \pm (-)\sqrt{q}}{r}$ 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]**

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)	$\frac{\sin A}{60} = \frac{\sin 115}{their(c)}$ oe $(\sin A =)\ \frac{\sin 115}{their(c)} \times 60$ 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)	$\frac{10\times30+7\times31+x\times32}{10+7+x} = 30.65$ correct clearance of fraction 3 cao	**M1** **M1** **A1**	 Dep on **M1** e.g. $517 + 32x = 521.05 + 30.65x$ oe www3
(b) (i)	$\frac{35\times15+115\times21+26\times23+24\times27}{200}$ 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 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 angle, 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)	$\frac{8}{100}$ 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]**