

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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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

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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 $\frac{\text{their(a)(i)}}{40000} \times 100$
(b)	(\$) 11 200 ft	B1 ft	ft $17200 - \text{their (a)(i)}$
(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

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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 2 nd 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 $2 \times$ a positive root + 13

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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 $(1, -3)$ within 1 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

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

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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 <i>their (b) (i)</i> – 115
(c)	($AC^2 =$) $40^2 + 60^2 - 2 \times 40 \times 60 \times \cos 115$ ($AC =$) $\sqrt{\quad}$ of a correct combination 85(.0 km) cao	M2 M1 A1	M1 for correct implicit version dependent (7229) www4
(d)	$\frac{\sin A}{60} = \frac{\sin 115}{\text{their}(c)}$ oe ($\sin A =$) $\frac{\sin 115}{\text{their}(c)} \times 60$ 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	<i>their (c)</i> × sin(100 – <i>their (d)</i>) or <i>their (c)</i> × cos (<i>their (d)</i> – 10) M1 for either 40sin80 or 60sin35 or implicit trig version using <i>their (c)</i> www3

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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

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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

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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 <u>Z 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	

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9 (a)	(<i>p</i> =) 5 cao, (<i>q</i> =) 12 cao (<i>r</i> =) 1 ft	B1 B1 B1ft	Accept in correct order if no labels ft for <i>r</i> = 18 – <i>their p</i> – <i>their q</i> provided <i>r</i> not negative
(b) (i)	17 cao	B1	
(ii)	12 cao	B1	
(c) (i)	26 cao	B1	
(ii)	57 ft	B1ft	ft 45 + <i>their q</i>
(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 <i>their</i> 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

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10 (a) (i)	$\frac{8 \times (8+1)}{2} = 36$ $1 + 2 + 3 + \dots + 8 = 36$	E1 E1	
(ii)	80 200	B1	
(b) (i)	$2(1 + 2 + 3 + \dots + n) =$ $2 \times \frac{n(n+1)}{2} = n(n+1)$	E1	both steps must be shown
(ii)	40 200	B1	
(iii)	40 000	B1ft	ft <i>their (a)(ii)</i> – <i>their(b)(ii)</i> or <i>their (b)(ii)</i> – 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 <i>their (c)(i)</i> – $n(n+1)$ or $n(n+1) - n$ or $n/2(2+2(n-1))$

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