UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2007 question paper

0580 and 0581 MATHEMATICS

0580/04 and 0581/04 Paper 4 (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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UNIVERSITY of CAMBRIDGE
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Abbreviations

In addition to those already seen the following may crop up.

cao – correct answer only

ww – without working

www – without wrong working

oe – or equivalent

soi – seen or implied

bod – benefit of doubt

art – anything rounding to

isw – ignore subsequent working

ft – follow through

oor – out of range

isr – ignore subsequent rounding

rot – rounded or truncated

mog – marks on graph

1	(a) (i)	385 × 0.9 oe	M1	Implied by ans 346 or 347
		($) **346.5**(0) cao	A1	www2
	(ii)	385 ÷ 1.1(0) oe	M1	
		($) **350** **cao**	A1	www2
	(b) (i)	$\frac{23}{23+19} \times 210$ oe	M1	
		115 cao	A1	www2
	(ii)	their (i) × 2.50 + (210 – their (i)) × 1.50	M1	(287.5 + 142.5)
		($) 430 cao	A1	www2
	(iii)	{their (ii) – 410} / 410 (×100)oe	M1	Dep on (ii) being greater than 410
		4.88	A1	www2 (4.878 …) After M0, SC1 for 104.9 or better or 4.9 ww
	(c)	2.6(210 – *x)* or 1.4(210 – *x*) seen	M1	
		2.6(210 – *x*) + 1.4*x* = 480	M1	Allow 2.6*x* + 1.4 (210 – *x*) = 480
		546 – 480 = 2.6*x* – 1.4*x*		
		or 2.6*x* – 1.4*x* = 480 – 294	M1	Dep on M2
		55 cao	A1	if trial and error, B4 or B0 if using simultaneous equations $x + y = 210$ M1 $1.4x + 2.6y = 480$ M1 variable eliminated by correct method M1d After 0 scored, SC2 for ans 155 **[14]**

2	(a) (i)	**6**	B1	
	(ii)	**4.5**	B1	
	(iii)	$(1\times1+2\times2+4\times3+7\times4+4\times5+8\times6+2\times7)$ (127)	M1	Allow 1 slip
		÷ 28	M1dep	dep on 1st M1
		4.54	A1	www 3 4.53571…
	(iv)	$\frac{4}{28}\times\frac{3}{27}$	M1	*Accept all **probabilities** as fracts/dec/%* *-1 once for words or 2 sf, do not accept ratios i.s. cancelling after correct answer.*
		$\frac{\mathbf{1}}{\mathbf{63}}$ o.e.	A1	www2 e.g. ($\frac{12}{756}$, 0.0159 etc)
	(v)	$\frac{4}{21}\times\frac{3}{20}$	M1	
		$\frac{\mathbf{1}}{\mathbf{35}}$ o.e.	A1	www2 e.g. ($\frac{12}{420}$, 0.0286 etc)
	(vi)	$\frac{24}{28}\times\frac{23}{27}\times\frac{4}{26}$	M1	
		$\frac{\mathbf{92}}{\mathbf{819}}$ o.e.	A1	www2 e.g. ($\frac{2208}{19656}$, 0.112)
	(b) (i)	**0.08** o.e.	B1	
	(ii)	0.9 × 0.05	M1	
		their (b)(i) + 0.9 × 0.05	M1dep	dep on 1st M1
		0.125 o.e.	A1	www3
	(iii)	**7**	B1 ft	their (ii) × 56 either correct to 3sf or better or r.o.t. **[16]**

3	(a) (i)	**(0, 1)**	**B1**	Accept w/out brackets/ commas, condone vectors, or states $x =$, $y =$
	(ii)	**(4, 0) and (0, 4)**	**B1B1**	
	(b)	**-1** cao	**B1**	
	(c)	$(x) < 0$ (allow $\leq$)	**B1**	Any other variable < 0 B0
	(d)	$x^2 + 1 = 4 - x$ o.e.	**B1**	must be these 4 terms
	(e)	$\frac{p + (-)\sqrt{q}}{r}$ where $p = -1$ and $r = 2\times1$	**M1**	
		and $q = 1^2 - 4(1)(-3)$ o.e.	**M1**	Allow second mark if in form $p \pm \frac{\sqrt{q}}{r}$
		-2.30 , 1.30 cao www4	**A1A1**	If ww ans.correct but wrong acc - SC3 After A0, A0, SC1 for -2.3027756 and 1.3027756 rounded or truncated
	(f)	**(-0.5, 4.5 or 4.49)**	**B1ft**	f.t (their –2.30 + their 1.30) ÷2
			B1 ft	ft (4 – their x co-ord dep on attempt at mid value of x from values in e) **[12]**

4	(a) (i)	$4\pi3.5^2$ = **153.86 to 153.96 or 154**	**M1A1**	www2
	(ii)	$\frac{4}{3}\pi3.5^3$ = **179.5 to 179. 62 or 180**	**M1A1**	www2
	(iii)	their (ii)× 5.6	**M1**	
		1005 to 1006 or 1008or 1010 (g)	**A1ft**	their (ii)× 5.6 correct to 3sf or better (allow in kg)
	(b)	$\pi8^2 \times 8$ (1608-1609)	**M1**	Alt $\pi8^2 d = 2 \times$ their (ii) M1
		$\pi8^2 h = 2 \times$ their (ii) + $\pi8^2 \times 8$	**M1dep**	(2× their (a)(ii)) ÷ $(\pi8^2)$ M1dep
		(2× their (ii) + $\pi8^2 \times 8$) ÷ $(\pi8^2)$	**M1dep**	add 8 M1dep
		9.78 to 9.79 (cm)	**A1**	www4
	(c)	1000 (or 1) ÷4.8 ÷ $\frac{4}{3}\pi$	**M1**	49.7….. (or 0.0497)
		$\sqrt[3]{ans}$ (or 10 × $\sqrt[3]{ans}$)	**M1dep**	Dep on previous M1
		3.67 to 3.68 (cm)	**A1**	www3 figs 368 or ans 3.7 gets M2 **[13]**

5	(a)	(i)	$\sqrt{7^2 - 4^2}$ = **5.74** (cm)	**M1A1**	www2 5.74456…
		(ii)	**6.32** (cm)	**B1**	6.32455…..
	(b)		$2\times\frac{1}{2}\times 8\times$'5.74'$+2\times\frac{1}{2}\times 6\times$'6.32' $+ 8\times 6$	**M1**	
			131.8 to 132(cm^2)	**A1ft**	www2 ft 48 $+8\times$their (a)(i) $+ 6\times$their (a)(ii)
	(c)	(i)	$((PX)^2) = (\text{their (a)(i)})^2 - 3^2$	**M1**	or their a(ii)^2 - 4^2 or 7^2 - (3^2 + 4^2)
			$\sqrt{24}$ soi or **4.898..…** seen	**E1**	
		(ii)	Tan(PNX) = $\frac{their(c)(i)}{4}$ o.e.	**M1**	Alt correct trig methods involving their (a)(ii) M1 for correct explicit statement
			50.7 to 50.84 oe	**A1**	www2 for a trig ratio
		(iii)	(HPN) 180 – 2 × their (ii)	**M1**	
			78.3 to 79	**A1**	www2 Alt – cos rule method – M1 at explicit stage
		(iv)	tan = $\frac{their(c)(i)}{5}$ o.e.	**M2**	M1 for recognition of angle *PAX* or *PAC* oe
			44.4 to 44.43°	**A1**	Alt trig methods with PA = 7 used www3 44.4153086
		(v)	***PHN*** or ***PGM*** o.e. (letters)	**B1**	B0 if extras **[15]**

6	(a)	(i)	AB=13 cm **and** BD=15 cm (± 2 mm)	**B1**	
			Angle A = 80° (± 2°)	**B1**	
			A,B,C,D correct within 4 mm	**B1**	Dep. on B2
		(ii)	Angle ADB correct (57-61°) (± 2°)	**B1ft**	Either in working or written on diagram
			Angle DCB correct (101-105°) (± 2°)	**B1ft**	
		(iii)	Acc. bisector of angle *A* with arcs (at least 5 cm long) (± 2°)(± 2 mm)	**B2ft**	B1 for accurate without/wrong arcs
		(iv)	Acc. perp. bisector of *AD* with at least 1 pair of arcs (± 2°)(± 2 mm) (at least 5 cm long)	**B2ft**	B1 for accurate without/wrong arcs B1 for each if accurate with arcs but short
		(v)	'Correct' area shaded below their perp. bisector and below their angle bisector	**B1**	Dep. on at least B1 in (iii) and B1 in (iv)
	(b)	(i)	$\frac{\sin D}{26} = \frac{\sin 80}{30}$	**M1**	No M marks in (b) for <u>measuring + using</u> lengths from diagram e.g. AD = 20 m but allow 13, 15, 9 used for 26, 30, 18 in b
			$(\sin D =)\frac{26\sin 80}{30}$	**M1dep**	dep on 1st M
			58.57 to **58.6°**	**A1**	www3
		(ii)	Angle *BDC* = 41.4	**B1 ft**	Ft 100 – their 58.6
			$(BC^2 =)18^2 + 30^2 - 2\times 18\times 30\cos'41.4'$	**M1**	Allow 41 or 42 for angle BDC
			square root of correct collection	**M1dep**	Dep on 1st M (413.88…)
			20.3 to 20.35 (m) cao	**A1**	www4
		(iii)	$0.5\times 26\times 30\sin'41.4'+$ $0.5\times 18\times 30\sin'41.4'$ oe	**M2**	M1 for correct area of one triangle (257.9 or 178.6). Must see calc for trapezium height if used (30sin '41.4') Allow 41 or 42 for angle BDC
			436 to 437 (m^2) cao	**A1**	www3 **[20]**

7	**(a)**	Correct axes	**S1**	must fit on paper 2mm acc throughout Ignore labels on triangles throughout
	(b)	Correct triangle drawn (T)	**T1**	vertices at (8, 6), (6, 10) and (10, 12)
	(c) (i)	Correct reflection in $y = x$ drawn (P)	**P2ft**	ft their T, P1 for two correct vertices drawn (6, 8), (10, 6), (12, 10) **or** line $y = x$ correctly drawn (within 2mm of (12,12) if extended)
	(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	**B2**	B1 for a correct column
	(d) (i)	Correct enlargement, scale factor 0.5, centre (0,0) drawn (Q)	**Q2ft**	(4, 3), (3, 5), (5, 6) Q1 for any enlargement s.f. ½ or 2 correct vertices drawn SC1 for 3 points within 5 mm if rays method used **or** for correct enlargement but of P
	(ii)	Enlargement only (scale factor) 0.5 (centre) (0, 0) o.e.	**B1** **B1** **B1**	 indep indep
	(e)	Correct stretch drawn (R)	**R2ft**	R1 for two correct vertices ft (4, 6), (3, 10), (5, 12) **[13]**

8	**(a)**	**2**	**B1**	
	(b)	$\frac{3}{2x-1}+1$	**M1**	
		$\frac{3+2x-1}{2x-1}$	**M1**	Dep on 1st M1
		$\frac{\boldsymbol{2+2x}}{\boldsymbol{2x-1}}$ o.e. final ans	**A1**	www3
	(c)	$y = \frac{3}{x}+1$		$x = \frac{3}{y}+1$
		$y-1 = \frac{3}{x}$ or $xy = 3 + x$	**M1**	Alt $x-1 = \frac{3}{y}$
		$x(y-1) = 3$	**M1dep**	Dep on 1st M1 $y(x-1) = 3$
		$\frac{\boldsymbol{3}}{\boldsymbol{x-1}}$ o.e. final answer	**A1**	www3 $\frac{3}{x-1}$ o.e If answer is $x = \frac{3}{x-1}$ allow M2
	(d)	**256**	**B2**	B1 for $2^3 = 8$ or 2^8 seen
	(e)	$2^x = \frac{3}{-24/7}+1$	**M1**	M for r.h.s. followed by attempt at recognising 2^x = ……
		-3	**A1**	After M0, SC1 for 1/8 o.e seen www2 **[11]**

9	**(a)**		**-7, 512, $\frac{8}{9}$, 81, 2187, -2106**	**B6**	B1 each. Allow in any order ignore letters
	(b)	**(i)**	(P) **$9 - 2n$**	**B1**	Accept correct expressions in any form e.g. $7 - 2(n - 1)$
		(ii)	(Q) **n^3**	**B1**	If '$n =$' withhold the first mark earned
		(iii)	(R) **$\frac{n}{n+1}$**	**B1**	
		(iv)	(S) **$(n+1)^2$**	**B1**	
		(v)	(T) **3^{n-1}**	**B1**	
		(vi)	(U) **$(n+1)^2 - 3^{n-1}$**	**B1ft**	their (iv)-their (v) dep on both algebraic expressions
	(c)		their(b)(i) $= -777$ **393** cao	**M1** **A1**	 www2
	(d)		**12**	**B2**	SC1 for 11 or $n - 1 = 11$ or $3^{12}, 3^{11}$ seen **[16]**