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

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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

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 (\$) **346.5**(0) cao	**M1** **A1**	Implied by ans 346 or 347 www2
		(ii)	$385 \div 1.1(0)$ oe (\$) **350** **cao**	**M1** **A1**	 www2
	(b)	(i)	$\dfrac{23}{23+19} \times 210$ oe **115** cao	**M1** **A1**	 www2
		(ii)	their (i) $\times 2.50 + (210 -$ their (i)$) \times 1.50$ (\$) 430 cao	**M1** **A1**	(287.5 + 142.5) www2
		(iii)	{their (ii) $- 410$} / 410 ($\times 100$)oe 4.88	**M1** **A1**	Dep on (ii) being greater than 410 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 $2.6(210 - x) + 1.4x = 480$ $546 - 480 = 2.6x - 1.4x$ **or** $2.6x - 1.4x = 480 - 294$ **55** cao	**M1** **M1** **M1** **A1**	 Allow $2.6x + 1.4 (210 - x) = 480$ Dep on M2 if trial and error, B4 or B0 if using simultaneous equations $\qquad x + y = 210$ M1 $\qquad 1.4x + 2.6y = 480$ 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)	$(1\times 1 + 2\times 2 + 4\times 3 + 7\times 4 + 4\times 5 +$ $8\times 6 + 2\times 7)$ (127) $\div 28$ **4.54**	**M1** **M1dep** **A1**	Allow 1 slip dep on 1st M1 www 3 4.53571…
		(iv)	$\dfrac{4}{28} \times \dfrac{3}{27}$ $\dfrac{1}{63}$ o.e.	**M1** **A1**	*Accept all __probabilities__ as fracts/dec/%* *-1 once for words or 2 sf, do not accept* *ratios i.s. cancelling after correct answer.* www2 e.g. ($\frac{12}{756}$, 0.0159 etc)
		(v)	$\dfrac{4}{21} \times \dfrac{3}{20}$ $\dfrac{1}{35}$ o.e.	**M1** **A1**	 www2 e.g. ($\frac{12}{420}$, 0.0286 etc)
		(vi)	$\dfrac{24}{28} \times \dfrac{23}{27} \times \dfrac{4}{26}$ $\dfrac{92}{819}$ o.e.	**M1** **A1**	 www2 e.g. ($\frac{2208}{19656}$, 0.112)
	(b)	(i)	**0.08** o.e.	**B1**	
		(ii)	0.9×0.05 their (b)(i) $+ 0.9 \times 0.05$ **0.125** o.e.	**M1** **M1dep** **A1**	 dep on 1st M1 www3
		(iii)	**7**	**B1 ft**	their (ii) $\times 56$ either correct to 3sf or better or r.o.t. **[16]**

3	(a)	(i)	(0, 1)	B1	Accept w/out brackets/ commas, condone
		(ii)	(4, 0) and (0, 4)	B1B1	vectors, or states $x =$, $y =$
	(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)		$\dfrac{p + (-)\sqrt{q}}{r}$ where $p = -1$ <u>and</u> $r = 2 \times 1$ and $q = 1^2 - 4(1)(-3)$ o.e.	M1 M1	Allow second mark if in form $p \pm \dfrac{\sqrt{q}}{r}$
			-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 B1 ft	f.t (their –2.30 + their 1.30) $\div 2$ ft (4 – their x co-ord dep on attempt at mid value of x from values in e) **[12]**

4	(a)	(i)	$4\pi 3.5^2 =$ **153.86 to 153.96 or 154**	M1A1	www2
		(ii)	$\frac{4}{3}\pi 3.5^3 =$ **179.5 to 179. 62 or 180**	M1A1	www2
		(iii)	their (ii)$\times$ 5.6 **1005 to 1006 or 1008or 1010** (g)	M1 A1ft	their (ii)$\times$ 5.6 correct to 3sf or better (allow in kg)
	(b)		$\pi 8^2 \times 8$ (1608-1609) $\pi 8^2 h = 2 \times$ their (ii) $+ \pi 8^2 \times 8$ $(2 \times$ their (ii) $+ \pi 8^2 \times 8) \div (\pi 8^2)$ **9.78 to 9.79** (cm)	M1 M1dep M1dep A1	<u>Alt</u> $\pi 8^2 d = 2 \times$ their (ii) M1 (2$\times$their (a)(ii)) $\div (\pi 8^2)$ M1dep add 8 M1dep www4
	(c)		1000 (or 1) $\div 4.8 \div \frac{4}{3}\pi$ $\sqrt[3]{ans}$ (or $10 \times \sqrt[3]{ans}$) **3.67 to 3.68** (cm)	M1 M1dep A1	49.7….. (or 0.0497) Dep on previous M1 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)	$((PX)^2)$ = (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) = $\dfrac{their(c)(i)}{4}$ 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 $\times$ their (ii)	M1	
	78.3 to 79	A1	www2 Alt – cos rule method – M1 at explicit stage
(iv)	tan = $\dfrac{their(c)(i)}{5}$ 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)	$\dfrac{\sin D}{26} = \dfrac{\sin 80}{30}$	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
	$(\sin D =)\dfrac{26\sin 80}{30}$	M1dep	dep on 1st M
	58.57 to 58.6°	A1	www3
(ii)	Angle *BDC* = 41.4	B1 ft	Ft 100 – their 58.6
	$(BC^2 =)18^2 + 30^2 - 2 \times18\times30\cos$'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'$+$ $0.5\times18\times30\sin$'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]

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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)	$\dfrac{3}{2x-1} + 1$	M1	
		$\dfrac{3 + 2x - 1}{2x - 1}$	M1	Dep on 1st M1
		$\dfrac{2 + 2x}{2x - 1}$ o.e. final ans	A1	www3
	(c)	$y = \dfrac{3}{x} + 1$		$x = \dfrac{3}{y} + 1$
		$y - 1 = \dfrac{3}{x}$ or $xy = 3 + x$	M1	Alt $x - 1 = \dfrac{3}{y}$
		$x(y - 1) = 3$	M1dep	Dep on 1st M1 $y(x - 1) = 3$
		$\dfrac{3}{x - 1}$ o.e. final answer	A1	www3 $\dfrac{3}{x - 1}$ o.e If answer is $x = \dfrac{3}{x - 1}$ allow M2
	(d)	**256**	B2	B1 for $2^3 = 8$ or 2^8 seen
	(e)	$2^x = \dfrac{3}{-\,^{24}\!/_7} + 1$	M1	M for r.h.s. followed by attempt at recognising $2^x = \ldots\ldots\ldots\ldots\ldots$
		-3	A1	After M0, SC1 for 1/8 o.e seen www2 [11]

9	(a)			$-7, 512, \dfrac{8}{9}, 81, 2187, -2106$	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)	$\dfrac{n}{n+1}$	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) $= -777$	M1	
				393 cao	A1	www2
	(d)			**12**	B2	SC1 for 11 or $n - 1 = 11$ or $3^{12}, 3^{11}$ seen **[16]**