CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 130

SYLLABUS/COMPONENT: 0580/04, 0581/04

MATHEMATICS

Paper 4 (Extended)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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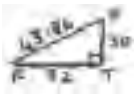
Marks in brackets are totals for questions or part questions.

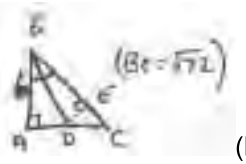
1	(a)		144:96	B1	After **B0**, allow **SC1** for reversed "correct" final ans. www2
			Final answer 3:2 or 1.5:1 or 1:0.667	B1	
				(2)	
	(b)	(i)	32 (children)	B1	
		(ii)	54 (adults off)	B1	
		(iii)	110 (adults on)	B1	
		(iv)	26 (=x) w.w.w.	B1	
				(4)	
	(c)		$300 \times \frac{4}{thier(6+5+4)}$	M1	
			80 children	A1	www2
				(2)	
	(d)	(i)	Final Ans. 21 13 or (0)9 13 pm	B1	Condone hrs but hrs and minutes ⇒ **BO**
		(ii)	7 h 20 min (o.e) $\times \frac{10}{110}$ $\left(\text{or} \times \frac{100}{110}\right)$	M1	Implied by 6 h 40 min or 400 min
			40 min	A1	www2
				(3)	
				(11)	
2	(a)	(i)	1.8(02..)	B1	Throughout (a)(i)(ii)(iii) NO misreads allowed.
		(ii)	$1.99^2 = \frac{80h}{3600}$ o.e.	M1	Must be h, not $\sqrt{h}$
			(h =) 178(.2)	A1	ww2 (Must be correct – e.g. 178.4 ⇒ **MO** ww)
		(iii)	$A^2 = \frac{hm}{3600}$	M1	(First step must be correct from correct formula for first **M1**.) Correctly squares at any stage
			$3600A^2 = hm$	M1	Correctly multiplies at any stage
			$\frac{3600A^2}{m} = h$	M1	Correctly divides at any stage
				(6)	Only a correct answer in this form can get **M3**.
	(b)	(i)	$(x + 4)(x - 4)$	B1	i.s.w. solutions in all (b)
		(ii)	$x(x - 16)$	B1	Condone loss of **final** bracket in any (b)
		(iii)	$(x - 8)(x - 1)$	B2	
				(4)	

	(c)	(i)	$x(3x - 9) = 2x^2 - 8$ o.e.		M1	
			$2x^2 - 8 = 3x^2 - 9x$			No error seen and some working to reach final quoted equation. Must have = 0. (E = established)
			$x^2 - 9x + 8 = 0$		E1	
		(ii)	$x = 1$		B1	
			$x = 8$		B1	
		(iii)	time = 15 (sec)	c.a.o.	B1	
			distance = 120 (m)	c.a.o.	B1	
					(6)	
					(16)	
3	(a)	(i)	$17^2 + 32^2 - 2.17.32 \cos 40°$		M2	Allow **M1** for sign error or correct implicit eqn
			√their 479.54		M1	Dep M2. NOT for $\sqrt{225\cos 40°}$ or $\sqrt{2146}$
			Answer in range 21.89 to 21.91 (m)		A1	www4
		(ii)	$\frac{\sin T}{17} = \frac{\sin 40°}{\text{their } 21.9}$		M1	or $17^2 = 32^2 + (\text{their } 21.9)^2 - 2.32.(\text{their } 21.9)\cos T$
			$\sin T = \frac{17 \sin 40°}{\text{their } 21.9}$	(0.499)	M1	$\cos T = \frac{32^2 + (\text{their } 21.9)^2 - 17^2}{2.32.(\text{their } 21.9)}$
			29.9°		A1	Accept 29.93° to 29.94°. www3
					(7)	
	(b)	(i)	125° c.a.o.		B1	All bearings must be $0° \leqslant \theta \leqslant 360°$ to score
	**	(ii)	305°		B1√	√ (180° + their 125°) correct
	**	(iii)	335° or 334.9°		B1√	√ (their 305° + their *T*) correct
					(3)	
	(c)		$\tan(\hat{F}) = \frac{30}{32}$ o.e.		M1	or $F\hat{X}T = \tan^{-1}\frac{32}{30}$ clearly identified. °
			43.2°		A1	(43.15239°) www2 NOT 43.1
					(2)	
					(12)	
4	(a)		Scale correct		S1	$0 \leqslant t \leqslant 7$ (14 cm) and 0 – 60 ↑ (12 cm)
			8 correct plots (0 , 0), (1 , 25),			Allow **P2** for 6 or 7 correct
			(2 , 37.5), (3 , 43.8), (4 , 46.9),		P3	**P1** for 4 or 5 correct
			(5 , 48.4), (6 , 49.2), (7 , 49.6)			Accuracy better than 2mm horizontally. In correct square ↑
			Reasonable curve through 8 points		C1	Not for linear or bad quality
					(5)	

(b)	(i)	f(8) = 49.8 or $49\frac{103}{128}$ o.e.	B1		Do not accept improper fractions
		f(9) = 49.9 or $49\frac{231}{256}$ o.e.	B1		
	(ii)	f(t large) ≈ 50	B1		
			(3)		
(c)	(i)	Tangent drawn at t = 2	B1		Not a chord and not daylight
		Uses vert/horiz using scale	M1		Can be given after **B0** if line not too far out
**		Answer correct for their tangent	A1 √		
	(ii)	Acceleration or units	B1		Accept ms^{-2}, m/s^2, m/s/s.
			(4)		
(d)	(i)	Straight line through (0 , 10)	B1	}	Must be ruled and full length to earn B2
		Straight line gradient 6	B1	}	
**	(ii)	one √ intersection value for t	B1√		
**		Second √ t and range	B1√		
	(iii)	Distance = area (under curve)	M1		
		First particle (f(t)) goes further	A1		
			(6)		
			(18)		
Marking final answers throughout this question					
5 (a)	(i)	0.2 o.e.	B1		Accept 2/10, 1/5, 20%
	(ii)	0.4 o.e.	B1		After first **B0**, condone "2 in 10" type answers.
	(iii)	0.5 o.e.	B1		Never condone 2 : 10 type
	(iv)	0.1 o.e.	B1		
	(v)	0	B1		Accept "none", "nothing", 0/10, nil, zero
			(5)		
(b)	(i)	2/10 x 1/9	M1		
		1/45 o.e.	A1		Accept 2/90, 0.0222 2.22% www2
	(ii)	3/10 x 2/9	M1		
		1/15 o.e.	A1		Accept 6/90 etc, 0.0666(or 7), 6.66 or 6.67% www2
	(iii)	(their) 1/45 + (their) 1/15	M1		
		4/45 o.e.	A1		Accept 8/90 etc, 0.0888(or 9), 8.88 or 8.89% www2
	(iv)	Clearly 1 – (their) 4.45 o.e.	M1		Alternative method must be complete
		41/45	A1		Accept 82/90 etc, 0.911, 91.1% www2
			(8)		
			(13)		

6	(a)		$\pi(30)^2$ (50)	M1		
			141 000 (cm^3)	A1	(141 300 to 141 430)	www2
				(2)		
	(b)	(i)	18 (cm)	B1		
		(ii)	$\cos\left(\frac{1}{2}\angle AOB\right)$ = (their 18)/30	M1	Allow M1 or M2 at similar stages for other methods e.g. sin A = 18/30 then (180° – 2A)	
			x2	M1dep		
			$\angle AOB$ = 106.26° c.a.o	A1	Must have 2 decimal places seen. ww1 (condone = 106.3 afterwards)	
				(4)		
	(c)	(i)	(their) $\frac{106.3}{360}$ used	M1		
			$\pi(30)^2$ used	M1		
			834 to 835.3 (cm^2)	A1	www3	
		(ii)	$\frac{1}{2}$.30.30sin (their) 106.3° or $\frac{1}{2}$.48.18	M1		
			431.8 to 432 (cm^2)	A1	www2	
		(iii)	Ans. Rounds to 403 cm^2	A1		
				(6)		
	(d)	(i)	50 x (their) 403	M1		
	**		20 100 to 20 200 (cm^3)	A1√	√ correct for their "403"	www2
	**	(ii)	20.1 to 20.2 (litres)	B1√	√ their previous answer ÷ 1000	
				(3)		
	(e)		$k\left[\frac{1}{2}\text{their (a)} - \text{their (d) (i)}\right]$	M1	k = 1 (cm^3) k = .001 (litres) k = other ⇒ consistent conversion error.	
			50.3 to 51 (litres)	A1	Marking final answer	www2
				(2)		
				(17)		
7	(a)	(i)	F $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$	M1 A1	M marks for letters, A marks for descriptions. If no letter given, allow **SC1** for correct description	
		(ii)	D x = 1	M1 A1		
		(iii)	E (2 , –1)	M1 A1		
		(iv)	C (s.f.) 3	M1 A1		
		(v)	A Shear	M1 A1		
				(10)		

	(b)		$(-1\ -2)\begin{pmatrix}1 & 3\\ 5 & 7\end{pmatrix}$ or QP	M1	Penalty –1 for <u>each</u> wrong one thought possible.
			(– 11 –17) <u>final</u> ans	A2	Allow **SC1** for one correct
			$(1\ 2\ 3)\begin{pmatrix}-1\\ 2\\ 3\end{pmatrix}$ or RS	M1	
			(12)	A2	Brackets essential here.
				(6)	Allow SC1 for 12 or –1 + 4 + 9
				(16)	
8	(a)	(i)	$10 < M \leqslant 15$	B1	Must clearly mean this and not 32
		(ii)	Midpoints 5, 12.5, 17.5, 22.5, 32.5	M1	Allow for 3 or 4 correct
			$\sum fx$ (60 + 400 + 490 + 540 + 780)	M1	(2270) Needs previous **M1** or only marginally out
			(their) 2270 ÷ 120	M1	dep previous **M1**
			18.9 (2) (kg)	A1	www4
			(1)		
		(iii)	36°	B1	
				(6)	
	(b)		Horizontal scale 2 cm ≡ 5 units	S1	$0 \leqslant M \leqslant 40$. Accuracy < 2 mm.
			(numbered or used correctly)		If **S0** (e.g. 1 cm ≡ 5 units) can score **B5**
					If **S0** (e.g. 0, 10, 15) can only score on correct width bars. Penalty –1 for polygon superimposed.
			Heights 3k, 16k, 14k, 12k, 4k cm	B5	If not scored, decide on their "k" and allow SC1 for each "correct" bar. (Needs ⩾ 2 bars to decide on value of k if $k \neq 1$.)
			Their k = 1	B1	
				(7)	
				(13)	
9	(a)	(i)	(Diagram) 5 only	B1	
		(ii)	(Diagram) 4 only	B1	
		(iii)	(Diagram) 2 only	B1	
				(3)	

(b)	Diagram 1 9 (cm^2)	B1	9.00 to 3 s.f.
	Diagrams 2 and 3 have same area	B1	
	One of them $\frac{1}{2}$ x 3 x 3	M1	
	$4\frac{1}{2}$ (cm^2)	A1	www2
	Diagram 4 $\frac{1}{4}$ $\pi 3^2$ s.o.i.	M1	(7.07 cm^2)
	$\frac{1}{2}$ x 6 x 6 – their $9\pi/4$	M1	indep. i.e. 18 – kπ where k numerical
	10.9 (cm^2)	A1	www3
	Diagram 5 $22\frac{1}{2}°$ s.o.i	M1	 (bc = $\sqrt{72}$)
	6 tan$22\frac{1}{2}°$	M1	(2.485) (This is AD or DE)
	$\frac{1}{2}$ (6 – their 2.485) x 6	dep.M1	or 18 – $\frac{1}{2}$ x 6 x their 2.485. (o.e.)
	10.5 (cm^2)	A1	www4
		(11)	
		(14)	