

November 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 130

SYLLABUS/COMPONENT: 0580/04, 0581/04

MATHEMATICS

Paper 4 (Extended)



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Marks in brackets are totals for questions or part questions.

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

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

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(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)	$f(t \text{ large}) \approx 50$	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 (4)	Accept ms^{-2} , m/s^2 , m/s/s .
(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 <u>and</u> range	B1 ✓	
(iii)	Distance = area (under curve)	M1	
	First particle ($f(t)$) goes further	A1 (6)	
		(18)	
<u>Marking final answers throughout this question</u>			
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 (5)	Accept "none", "nothing", 0/10, nil, zero
(b)	(i) $2/10 \times 1/9$	M1	
	$1/45$ o.e.	A1	Accept 2/90, 0.0222 2.22% www2
	(ii) $3/10 \times 2/9$	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)	<u>Clearly</u> $1 -$ (their) 4.45 o.e.	M1	Alternative method must be complete
	$41/45$	A1 (8)	Accept 82/90 etc, 0.911, 91.1% www2
		(13)	

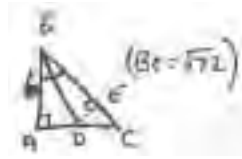
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6	(a)	$\pi(30)^2$ (50) 141 000 (cm ³)	M1 A1 (2)	(141 300 to 141 430) www2
	(b) (i)	18 (cm)	B1	
	(ii)	$\cos\left(\frac{1}{2}\angle AOB\right) = (\text{their } 18)/30$ x2 $\angle AOB = 106.26^\circ$ c.a.o	M1 M1dep A1 (4)	Allow M1 or M2 at similar stages for other methods e.g. $\sin A = 18/30$ then $(180^\circ - 2A)$ Must have 2 decimal places seen. ww1 (condone = 106.3 afterwards)
	(c) (i)	(their) $\frac{106.3}{360}$ used $\pi(30)^2$ used 834 to 835.3 (cm ²)	M1 M1 A1 M1	www3
	(ii)	$\frac{1}{2} \cdot 30.30 \sin (\text{their } 106.3^\circ)$ or $\frac{1}{2} \cdot 48.18$ 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√ (3)	√ their previous answer ÷ 1000
	(e)	$k\left[\frac{1}{2}\text{their (a)} - \text{their (d)} \quad (\text{i})\right]$ 50.3 to 51 (litres)	M1 A1 (2) (17)	$k = 1$ (cm ³) $k = .001$ (litres) $k = \text{other} \Rightarrow$ consistent conversion error. Marking final answer www2
7	(a) (i)	$F \begin{pmatrix} 2 \\ -4 \end{pmatrix}$	M1 A1	M marks for letters, A marks for descriptions. If <u>no</u> 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)	

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	(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.
8	(a)	(i) $10 < M \leq 15$	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) $2270 \div 120$	M1	dep previous M1
		18.9 (2) (kg)	A1	www4
	(iii)	(1)		
		36°	B1	
	(b)		(6)	
		Horizontal scale 2 cm $\equiv$ 5 units (numbered or used correctly)	S1	$0 \leq M \leq 40$. Accuracy < 2 mm. If S0 (e.g. 1 cm $\equiv$ 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)	

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