MARK SCHEME for the October/November 2007 question paper

4024 MATHEMATICS

4024/01

Paper 1, maximum raw mark 80

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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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UNIVERSITY of CAMBRIDGE International Examinations

Page 2	Mark Scheme	Syllabus	Paper
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1	(-)	0	1	
1	(a)	$\frac{9}{40}$ cao	1	
	(b)	0.018 or equiv.	1	e.g. $\frac{9}{500}$, 1.8 x 10 ⁻²
2	(a)	$\frac{8}{9}$ cao	1	
	(b)	$\frac{1}{6}$ cao	1	
3	(a)	4.32(0)	1	not 4320. Accept $4\frac{32}{100}$ or equiv.
	(b)	$(-1)^3$, 3^{-1} , 3^0 , 3^1	1	Accept corresponding correct values
4	(a)	56°	1	
	(b)	2 cm	1	
5	(a)	375	1	
	(b)	27	1	
6	(a)	6	1	
	(b)	3-2x	1	Accept any correct equiv.
7		rectangle from 4-5 height 20 rectangle from 5-8 height 5	1 1	
8	(a)	y > 1, $y < 2x$ or equiv.	1+1	or sc1 for using the two correct equations but with the wrong inequalities
	(b)	3	1	out with the wrong mequanties
9	(a)	$B \cap C \cap A'$	1	
	(b)	(i) 31 (ii) 9 or f.t. 40 – their (b)(i)	$\begin{array}{c} 1 \\ 1 \ \end{array}$	
10	(a)	(8 -3)		
		$\begin{pmatrix} 9 & -4 \end{pmatrix}$	1	
	(b)	$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$	1	
	(c)	$ \begin{pmatrix} 0 & \frac{1}{3} \\ -1 & 1\frac{1}{3} \end{pmatrix} $	1	(0 1)
		$\begin{pmatrix} -1 & 1\frac{1}{3} \end{pmatrix}$		Allow $\frac{1}{3} \begin{pmatrix} 0 & 1 \\ -3 & 4 \end{pmatrix}$
				Accept decimals to 2 d.p. or better.
11	(a)	5.35 5.45 82.5 87.5 all correct	2	or B1 for 2 or 3 correct
	(b)	189.5 g or f.t. from their lower bounds	1^{2}	
12	(a)	120 newtons	1	
	(b)	8	2 *	or B1 for " <i>k</i> " = 24
L	1	1	1	I

	Page 3						Sch					S	yllabı		Р	aper
			GCE O LEVEL – October/November 2007								4024			01		
13	(a)	4 minut	es						1							
10	(u) (b)	st. line from $(0,0)$ to (their (a) , $2h$) st. line from (their (a) , $2h$) to $(12, 3h)$						1		sc1 for a single straight line from $(0,0)$ t $(12,3h)$ regardless of the value in (a).						
14	(a)	x = 28							1							
	(b)	x - 28 $y = \frac{2}{3}$ (accept 0.66 or better)						2	*	or B1 for $-10 + 2y$ or $-5 + y$ seen						
15		Any 3 c Most po							1	*						
W L A	3 33 99		5 29 145	6 27 162	7 25 175	8 23 184	9 21 189	10 19 190	11 17 187	12 15 180	13 13 169	14 11 154	15 9 135	16 7 112	17 5 85	18 3 54
		Length Area =							1 1							
16		<i>x</i> = 7	<i>y</i> = -2					bot	h 3					values	that fi	ts either
17	(a)	(i) 5	x 10 ⁻²						1							
		(ii) 2	x 10 ²						1							
	(b)	(i) 2	$x 3^2 x 5$	5^{3} (or 2)	$2^{1} \times 3^{2}$	$(x 5^3)$			1		Accer	ot 3x3	etc			
	(~)		= 12	(1		P					
18	(a)	$\frac{360}{180-165}$	or 180	(n-2)	= 165	<i>n</i> or e	quiv	М	1							
		24						A	1 2	*						
	(b)	45							2	*	or D 1	for 30	or 150	soon		
	(0)	75							2		01 D1	101 50	01 150	seen		
19	(a)	40							2	*	rounds or B1		h 16 ar			swer that), or
	(b)	their10 their1	— or :	500 x 6	50			М	1		•					
		30 km/ł						A	1 2	*	Accep	ot 29.8 1	to 30.3	1		
20	(a)	$3a^2(5-$	+4a)						1							
	(b)	(1 - 4b)	(1+4b))					1							
	(c)	(3 <i>c</i> – <i>d</i>)	(2x-y)						2	*		for cor 70 term		artial f	actoris	sation of

Page 4	Mark Scheme	Syllabus	Paper	
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(b) (i) $\frac{3}{10}$ or 0.3 1 (ii) 0 cao 1 (iii) $\frac{1}{10}$ or 0.1 1 22 (a) clear 30 + (300 - $\frac{1}{2} \times 30 \times "12"$) + "12" M1 40 s A1 2 * or sc1 for a final answer of 10 (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand (b) tangent drawn at $t = 55$ T1 no "sc1 for a final answer of 10 (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand (b) tangent drawn at $t = 55$ T1 no "sc1 for a final answer of 10 (ii) 24 (+ or -) B1 2 * or sc1 for $\frac{\text{their (a)}}{3000} \times x$ 24 (a) (4) - 8, - 16, - 12 1 i $y = n^2$ 1 i i and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1 i i	21	(a)	$h = \frac{1}{4}$ or 0.25	1	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1					
22 (a) clear $30 + (300 - \frac{1}{2} \times 30 \times "12") \div "12"$ M1 A1 A1 2* or sc1 for a final answer of 10 or B1 for 180 or 120 seen (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand 0.12 to 0.24 (+ or -) B1 2* or sc1 for a final answer of 10 23 (a) 20°C 1 (b) (i) 4°C 1 (ii) 2400 m 1 (iii) 16 - $\frac{x}{150}$ 2 or sc1 for $\frac{\text{their (a)}}{3000} \times x$ 24 (a) (4) 8, 16, 12 1 (b) $x = 2n$ 1 $y = n^2$ $z = n^2 - n$ or equiv 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1		(b)	(i) $\frac{3}{10}$ or 0.3	1	
22 (a) clear $30 + (300 - \frac{1}{2} \times 30 \times "12") \div "12"$ M1 A1 2 * or sc1 for a final answer of 10 or B1 for 180 or 120 seen (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand 0.12 to 0.24 (+ or -) B1 2 * dep. on using an acceptable tangent 23 (a) 20°C 1 (b) (i) 4°C 1 (ii) 2400 m 1 1 (iii) 16 - $\frac{x}{150}$ 2 or sc1 for $\frac{\text{their } (a)}{3000} \times x$ 24 (a) (4) 8, 16, 12 1 (b) $x = 2n$ 1 1 $y = n^2$ 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1			(ii) 0 cao	1	
(b) 40 s A1 2 * or sc1 for a final answer of 10 or B1 for 180 or 120 seen (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand 0.12 to 0.24 (+ or -) B1 2 * dep. on using an acceptable tangent 23 (a) 20°C 1 (ii) 4°C (iii) 2400 m 1 1 or sc1 for $\frac{\text{their (a)}}{3000} \times x$ 24 (a) (4) 8, 16, 12 1 1 $y = n^2$ 1 1 1 1 $y = n^2$ 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1			(iii) $\frac{1}{10}$ or 0.1	1	
40 s A1 2 * or set for a final answer of for or B1 for 180 or 120 seen (b) tangent drawn at $t = 55$ T1 no "daylight", nor freehand 0.12 to 0.24 (+ or -) B1 2 * dep. on using an acceptable tangent 23 (a) 20°C 1	22	(a)	clear $30 + (300 - \frac{1}{2} \times 30 \times "12") \div "12"$ M1		
Image: margin marker of a constraint of a cons			_	2 *	
Image: margin marker of a constraint of a cons					
23 (a) $20^{\circ}C$ 1 (b) (i) $4^{\circ}C$ 1 (ii) 2400 m 1 (iii) $16 - \frac{x}{150}$ 2 24 (a) (4) 8, 16, 12 1 (b) $x = 2n$ 1 $y = n^2$ 1 $z = n^2 - n$ or equiv 2 25 (a) 293° to 295°		(b)	tangent drawn at $t = 55$ T1		no "daylight", nor freehand
(b) (i) $4^{\circ}C$ 1 (ii) 2400 m 1 (iii) $16 - \frac{x}{150}$ 2 24 (a) (4) 8, 16, 12 1 (b) $x = 2n$ 1 $y = n^2$ 1 1 $z = n^2 - n$ or equiv 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1			0.12 to 0.24 (+ or -) B1	2 *	dep. on using an acceptable tangent
(ii) 2400 m 1 (iii) $16 - \frac{x}{150}$ 2 or sc1 for $\frac{\text{their (a)}}{3000} \times x$ 24 (a) (4) 8, 16, 12 (b) $x = 2n$ 1 1 $y = n^2$ 1 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1	23	(a)	20°C	1	
(a) (b) $x = 2n$ (c) (c) $x = 2n$ (b) $x = 2n$ 1 1 $y = n^2$ 1 1 $z = n^2 - n$ or equiv 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1		(b)	(i) 4°C	1	
24 (a) (4) 8, 16, 12 1 (b) $x = 2n$ 1 1 1 $y = n^2$ 1 1 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1			(ii) 2400 m	1	
(b) $x = 2n$ $y = n^2$ $z = n^2 - n$ or equiv 2 or sc1 for a correct expression in term x and/or y (and possibly also including the variable n) 25 (a) 293° to 295° 1			(iii) $16 - \frac{x}{150}$	2	or sc1 for $\frac{\text{their}(a)}{3000} \times x$
$y = n^2$ 1 $z = n^2 - n$ or equiv2 $z = n^2 - n$ or equiv2 $z = n^2 - n$ or equiv1 $z = n^2 - n$ or equiv1 $z = n^2 - n$ or equiv1	24	(a)	(4) 8, 16, 12	1	
$z = n^2 - n$ or equiv2or sc1 for a correct expression in term x and/or y (and possibly also including the variable n)25(a)293° to 295°1		(b)	x = 2n	1	
x and/or y (and possibly also including the variable n)25(a)293° to 295°1			$y = n^2$	1	
			$z = n^2 - n$ or equiv	2	or sc1 for a correct expression in terms of x and/or y (and possibly also including the variable n)
(b) completed ΔACD with two arcs at D 1 within 2 mm of correct pt	25	(a)	293° to 295°	1	
		(b)	completed $\triangle ACD$ with two arcs at D	1	within 2 mm of correct pt
(c) (i) perp. bisector of AC (ii) line parallel to AB , 5 cm above AB 1 within 2 mm, 2° within 2 mm		(c)			
(ii) line parallel to AB , 5 cm above AB 1 within 2 mm Accept dashed lines.			(II) line parallel to AB, 5 cm above AB		
(d) $CP = 6.3$ to 6.7 1dep. on the correct loci and the label R their intersection		(d)	CP = 6.3 to 6.7	1	dep. on the correct loci and the label <i>P</i> at their intersection