UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2006 question paper

4024 MATHEMATICS

4024/01 Paper 1, maximum raw mark 80

This mark scheme is published as an aid to teachers and students, 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.

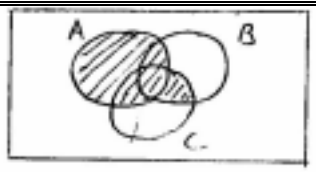
The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2006 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1	**(a)**	1	**1**	
	(b)	$\frac{8}{15}$ o.e.	**1**	Accept 0.53 or better
2	**(a)**	1.77(0….)	**1**	
	(b)	147	**1**	
3	**(a)**	$5x^6$	**1**	
	(b)	$1\frac{1}{2}$ or −2	**1**	Accept $\frac{3}{2}$, 1.5
4	**(a)**	80	**1**	
	(b)	$62\frac{1}{2}$	**1**	Not $\frac{125}{2}$ Accept 62.5
5	**(a)**	0.7^2, $\frac{7}{11}$, 0.7, $\frac{7}{9}$	**1**	Accept any equivalents
	(b)	400	**1**	
6	**(a)**	34	**1**	Accept –34, ±34
	(b)	−9	**1**	
7	**(a)**	$\frac{13}{18}$ o.e.	**1**	Not $\frac{6.5}{9}$
	(b)	70 c.a.o.	**1**	Accept –70, ±70, 7 x 10, 10 x 7
	(c)	8 c.a.o.	**1**	Accept –8, ±8 Not 8 x 1
8	**(a)**	2^2 x 3^3	**1**	Accept 2 x 2 etc. condone $x1^n$ throughout
	(b)	2^3 x 3^3 x 5	**1***	Answer 1080 look back. Give mark if correct prime factors seen
	(c)	75 or 3 x 5^2	**1**	
9	**(a)**	−1 (⩽x <) 2 B1 + B1	**2**	Reversed answers – SC1
	(b)	−1, 0, 1 √	**1** √	Given $-p \leqslant x < q$ in **(a)**, allow √ if p and q are positive integers
		NB: 0 must be included		
10	**(a)**	5:2 c.a.o	**1**	Inclusion of units ⇒ no marks
	(b)	2.1 x 10^8	**2**	SC1 for figs. 21; Condone –2.1 x 10^8
11	**(a)**	$\frac{4}{15}$ o.e.	**1**	Allow $\frac{4x}{15}$
	(b)	$\left(\frac{2}{5}-\frac{1}{3}\right)$C = 1600 o.e. M1		SC1 for $\frac{1}{15}$ s.o.i.
		($)24 000 A1	**2***	
12	**(a)**	$3a - 2c$ o.e.	**1**	
	(b)	Establishing $k\ \overrightarrow{OP} = \ell\ \overrightarrow{BA}$	**1***	Must be numerical
	(c)	$\frac{3}{2}$ o.e.	**1**	Accept 1.5, 3:2
13	**(a)**	Correct, ruled, line (and no others)	**1**	Accept if line dotted. 3 mm tolerance
	(b)	correct method to produce 900 (7 sided) M1 or correct method to produce 720 (6 sided) or correct method to produce 540 (5 sided) or $\frac{360 - \text{their } 54}{6}$ or $6x = 360 - 54$ (ext < method)		
		129 A1	**2***	

14	**(a)**	$\frac{16}{27}$	**1**	
	(b)	$\frac{2}{3}x\frac{1}{9}+\frac{1}{3}x\frac{4}{9}$ M1 $\frac{6}{27}$ A1	**2***	
15	**(a)**	9	**1**	
	(b)	3π Both correct 3 *		In **(b)** condone 3, $k = 3$, $3k\pi$.
	(c)	60° or $\frac{\pi}{3}$ One correct 2	**1**	If no marks:- M1 for circum = 18π or 2π x their **(a)** √ Must be numerical
16	**(a)**	**(i)** 2	**1**	Condone $2p$
		(ii) $5\sqrt{}$ 3 their **(a)** −1	**1**	Condone $5q$ or $5x$
	(b)	$\left(-\frac{1}{2},0\right)$ and $(5,0)$	**1**	
17	**(a)**	**(i)** 2	**1**	Accept $(y\alpha)\ x^2$ or $(y =)\ kx^2$
		(ii) 1	**1**	Accept $(y\alpha)\ x^1$ or $(y =)\ kx^1$
	(b)	4	**2**	
18	**(a)**	2 pairs of angles stated equal B1 Reasons + conclusion (dep on 1st B1) B1	**2**	Lost for wrong or irrelevant statements
	(b)	**(i)** 12	**1**	
		(ii) $\frac{x}{14-x}=\frac{2}{3}$ o.e. M1 BX= $\frac{28}{5}$ o.e. A1	**2***	

14	**(a)**	1550 (⩽ distance <) 1650 B1 5.5 (⩽ speed <) 6.5 B1	**2**	SC1 for any 2 seen
	(b)	300 sec o.e.	**1**	
15	**(a)**	$\begin{pmatrix} -4 & 2 \\ -6 & 0 \end{pmatrix}$ o.e.	**2**	SC1 for 3 correct elements condone intrusive letters
	(b)	$-\frac{1}{2}\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ o.e. B1 + B1	**2***	seen and isw
16	**(a)**	**(i)** $4p + 7$ c.a.o	**1**	
		(ii) $-1\sqrt{}$ solution of (their $4p + 7$) = 3	**1**	
	(b)	$(a-1)^2 - 1$ M1 $a^2 - 2a$ or $a(a-2)$ A1	**2***	
17	**(a)**	$y = 2x + 3$ o.e.	**1**	
	(b)	**(i)** Lines $x = 1$ and $y = 3$ drawn B1 Lines $x + y = 2$ drawn B1	**2**	
		(ii) Correct region identified dept. on all 3 lines correct condoning minor inacc.	**1**	Part of region below the x axis should be indicated
18	**(a)**		**1**	
	(b)	$P \cap Q'$ o.e.	**1**	$(P' \cup Q)'$
	(c)	$25 - x + x + 20 - x + 4$ (= 36) M1 13 A1	**2***	Diag. with x, $25 - x$, $20 - x$, 4 all marked earns the M1

19	**(a)**	20	**1**	
	(b)	110	**1**	
	(c)	20	**1**	
	(d)	50 or 180 – [their (y + z)] √	**1**	
20	**(a)**	3:5 c.a.o. or $\frac{3}{5}$ c.a.o	**1**	Accept fraction: condone inclusion of units
	(b)	9:25 or (their **(a)**)^2	**1**	Accept 9π: 25π
	(c)	Idea of $\left(\frac{3}{5}\right)^3$ M1		NB. $\left(\frac{5}{3}\right)^3$ is M1
		27:98 c.a.o A1	**2***	
21	**(a)**	**(i)** $\frac{15}{8}$ o.e. seen	**1***	Allow 1.88 but not 1.9; Not $\frac{7.5}{4}$
		(ii) 95	**1**	
	(b)	Graph from (0,0) to (20, 95) √	**1**	Graph must be continuous and non decending
		Fully correct graph or √ to their 95 St. line (+ve gradient) from t = 0-6 correct curvature from t = 6-8 horiz line (not on axis) from t = 8-12 correct curvature from t = 12-20	**2**	If graph not fully correct:- SC1 for 2 or 3 parts correct
22	**(a)**	**(i)** 15	**1**	Not –15 [but allow √ mark in **(c)** for –30]
		(ii) (10,9)	**1**	
		(iii) 30 √ 2 x their 15	**1**	
		(iv) $\frac{6}{10}$ o.e.	**1**	
	(b)	$-\frac{5}{k}$ or $\frac{k^2-111}{10k}$	**1**	Accept $-\frac{5}{\sqrt{61}}$
23	**(a)**	Arc of circle, centre L, radius 2 cm	**1**	Allow within 2 mm
	(b)	St lines, parallel to AB and BC, 2 cm distance B1 Fully correct locus +B1 dep	**2**	
	(c)	25 (and) 48 or 29 and 48 $(\pm 2^o)$ B1 + B1	**2**	Correct locus range 23 → 50 incl. If sharp loci range 27 → 50 incl. SC1 if one angle in range or for reversed angles √ from their loci (arc or point) dept. on relevant locus
24	**(a)**	Δ drawn (4,4), (8,4) and (10,2)	**1**	
	(b)	Rotation B1 90 ° CW, centre (0,0) B1	**2**	Not turn: extra transf. seen loses both marks Condone –90°; Allow $\begin{pmatrix}0\\0\end{pmatrix}$ or 0.
	(c)	Δ drawn (−2, 2), (−4, 2), (−5, 1) B2	**2***	SC1 for 2 points plotted or for 3 pts stated