

## 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.




Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	01

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

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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	$\left. \begin{array}{l} \text{Both correct 3} \\ \text{One correct 2} \end{array} \right\} *$	1	In (b) condone 3, $k = 3, 3k\pi$ . If no marks:- M1 for circum = $18\pi$ or $2\pi$ x their (a) $\checkmark$ Must be numerical
	(b)	$3\pi$		1	
	(c)	$60^\circ$ or $\frac{\pi}{3}$			
16	(a)	(i) 2		1	Condone 2p Condone 5q or 5x
		(ii) $5\sqrt{3}$ their (a) -1		1	
	(b)	$\left(-\frac{1}{2}, 0\right)$ and (5,0)		1	
17	(a)	(i) 2		1	Accept $(y \propto) x^2$ or $(y =) kx^2$ Accept $(y \propto) x^1$ or $(y =) kx^1$
		(ii) 1		1	
	(b)	4		2	
18	(a)	2 pairs of angles stated equal	B1	2	Lost for wrong or irrelevant statements
		Reasons + conclusion (dep on 1 <sup>st</sup> B1)	B1		
	(b)	(i) 12		1	
		(ii) $\frac{x}{14-x} = \frac{2}{3}$ o.e.	M1		
		BX = $\frac{28}{5}$ o.e.	A1	2*	

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

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