#### UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Ordinary Level

## MARK SCHEME for the June 2005 question paper

### **4024 MATHEMATICS**

4024/02

Paper 2, maximum raw mark 100

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 initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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*.

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

CIE is publishing the mark schemes for the June 2005 question papers for most IGCSE and GCE Advanced Level syllabuses.



#### **Mark Scheme Notes**

Marks are of the following three types:

- Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.
- A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated method mark is earned (or implied).
- B Mark for a correct result or statement independent of method marks.
- When a part of a question has two or more "method" steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly when there are several B marks allocated. The notation DM or DB (or dep\*) is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.
- The symbol √ implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A or B marks are given for correct work only. A and B marks are not given for fortuitously "correct" answers or results obtained from incorrect working.
- Note: B2 or A2 means that the candidate can earn 2 or 0.
   B2/1/0 means that the candidate can earn anything from 0 to 2.



The following abbreviations may be used in a mark scheme or used on the scripts:

A.G. Answer given
b.o.d. Benefit of doubt
c.a.o Correct answer only
(in)dep (In) dependent
Ex.Q. Extra question
Follow through
Further error made

I.S.W. Ignore subsequent working

M.R. Misread o.e. Or equivalent

O.W. Omission of essential working P.A. Premature approximation

S.C. Special case s.o.i Seen or implied S.O.S. See other solution t.&e. Trial and error

W.W. Without working (i.e. answer only seen)

W.W.W. Without wrong working

(£) or (°) Condone the omission of the £ or degree sign etc.

### **JUNE 2005**

### GCE O LEVEL

# MARK SCHEME

**MAXIMUM MARK: 100** 

**SYLLABUS/COMPONENT: 4024/02** 

MATHEMATICS PAPER 2



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Page 1	Mark Scheme	Syllabus		Paper
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1	(a)	(i) (ii)	$9 - 5p$ $3q^2 - 2r^2$	B1 B1	+5qr	B1	1 2	
	(b)		2(3t+1)(3t-1)	B2			2	SC1 for any incomplete (correct) factorisation
	(c)	(i) (ii)	$30 \\ 3x^2 = 75$	B1 M1	<i>x</i> = ± 5	<b>A</b> 1	1 2	x = 5 (or -5)
		(iii)	$y - 18 = 3x^2$	M1	$x = \sqrt{\frac{1}{3}}(y - 18)$	8) <b>A1</b>	2	implies M1
							10	
2	(a)	(i) (ii)	150 (g) 450 : 550 or better	B1 M1	9 : 11	<b>A</b> 1	1 2	Accept $\frac{9}{11}$ etc.
		(iii)	'their' 150 + 450 1250 (figs)	M1	48%	<b>A1</b>	2	SC1 for 11 : 9
	(b)	(i) (ii)	(\$) $3.60$ Idea that $$6.20 = 80\%$	B1 M1	\$7.75	<b>A</b> 1	1 2 <b>8</b>	
3	(a)	(i) (ii) (iii) (iv)	t = 69 u = 57 x = 72 y = 15	B1 B1 B1 B1			1 1 1	
	(b)		3z + 3 x 105	M1	z = 135	<b>A</b> 1	2	N.B. Alt. method using pentagon.
	(c)	(i) (ii)	12 (cm) $\frac{18}{PS} = \frac{14}{18}$ (or $\frac{his}{18}$ )	B1 M1	15 (cm)	<b>A</b> 1	1 2	
							9	
4	(a)	(i)	20 cos 55	M1	34.8 – 35 (cm)	) <b>A1</b>	2	
		(ii)	'their'	B1 🖍			1 -	
		(iii)	34.9 + 20 = 54.8 – 35 (cm) 20 sin 55	M1	16.3 – 16.4	<b>A</b> 1	2	
	(b)		Arc of circle	B1	Centre C <u>or</u> 12 <u>or</u> <i>r</i> = 20	25° <b>B1</b>	2	
	(c)		<u>125</u> 360	M1	43.6 – 43.66	<b>A1</b>	2	
							9	

Page 2	Mark Scheme	Syllabus	Paper
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5	(a)	(i)	Mode = 0	B1			1	If 0 and 8 mentioned, 0 must clearly be the intended answer
		(ii) (iii)	Median = 1 Mean = $\frac{(0 \times 8) + (1 \times 5) + \dots}{8 + 5 + \dots}$	B1 M1	= 1.6	<b>A</b> 1	1 2	Accept $\frac{8}{5}$ , $1\frac{3}{5}$ , $1\frac{6}{10}$
	(b)	(i)	$p = \frac{1}{5}$ , $q = 1$ , $r = 0$ o.e	B2			2	Allow <b>B1</b> for any 1 correct.
		(ii)(a)	2 7	B1			1	
		(b)	$\frac{4}{21}$	B1			1	
		(c)	$\frac{4}{7}$ or 'their' $\frac{4}{21} \times 3$	B2 🖍			2 -	<b>SC1</b> for 3 x their $\frac{4}{21}$ or for $\frac{8}{21}$
							10	21 21
6	(a)		73 – 37 = 36	B1			1	
	(b)		Any other 3 pairs	B1			1	
	(c)		Multiples of 9, digits add up to 9	B1			1	
	(d)	(i) (ii)	10x + y  10x + y - (10y - x)	B1 M1	=9x-9y	<b>A</b> 1	1 2 <b>6</b>	
7	(a)		$2x^2 = 500$	M1	15.8 – 15.82 (	(cm) <b>A1</b>	2	
	(b)		$\frac{1}{3}$ x 150 x $h$ = 500	M1	10 (cm)	<b>A</b> 1	2	
	(c)		$\frac{4}{3}\pi^{3} = 500$	M1	4.9 – 4.925 (c	m) <b>A1</b>	2	
	(d)		Use of <i>R</i> and <i>R</i> + 1.5 o.e	M1	or Use of R+	1.5 2 <b>M1</b>		
			Area of x section = $\pi \left[ (R+1.5)^2 - R^2 \right]$	A1	Area of x sect = $2\pi \left[ R + \frac{1.5}{2} \right] \times 1$			
			Area of x section = $\frac{500}{6}$	B1	_			
	(e)		$R = 8 - 8.1 \text{ (cm)}$ $\left(\frac{2}{5}\right)^3$	B1 M1	32 (cm <sup>3</sup> )	<b>A</b> 1	4 2	
							12	

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8	(a)		Scales	S1		
			All 10 points correctly plotted (within 1 mm)			
			Smooth curve			
			through points (allow marginally		3	Lost for straight lines,
			incorrect points)	C1		incomplete, grossly thick
	(b)	(i)	Negative value	T1		
		(ii)	0.32 to 0.45 Rate at which water	T1	3	
		( )	level is changing or			
			fall of water level per hour o.e	R1		
	(c)	(i)	4 (m)	B1		
	(0)	(i) (ii)	Straight line through	L2		Allow ( <b>L1</b> ) for any st. line
			(0,4) and (6,2)			through (0,4) with –ve gradient
		(iii)	Their 2 – their 1.2	M1 75 – 85 A1		gradion
		(iv)	5.7 – 5.9	B1	6 <b>12</b>	
9	(a)	(i)	sin <i>D</i> sin118	<b>M1</b> . 5 600 sin 118		All <b>M</b> and <b>A</b> marks
	(u)	(')	$\frac{31112}{600} = \frac{311110}{950}$	$\mathbf{M1} \Rightarrow \sin D = \frac{600 \sin 118}{950}$		available for any
			Ô 22.00 22.0	M1 A1		COMPLETE alternative methods.
			$\hat{D} = 33.89 - 33.9 \Rightarrow$ B = 28.1 - 28.11	A1	~4	
			(62 - their 33.9)			
		(ii)	$(CD^2=) 1040^2 + 950^2 -$	- (or+)(2) 1040.950. cos42 <b>M1</b>		N.B. $1040^2 + 950^2 - CD^2$
						$\cos 42 = \frac{1040^2 + 950^2 - CD^2}{2 \times 1040 \times 950}$
			$CD^2 = 1040^2 + 950^2 -$	· 2.1040.950 cos42 <b>M1</b>		gets the first <b>M1</b>
			= 515000 - 516000	A1		
		(iii)	CD = 716 - 719  (m) CN = 1040 sin 42	A1 M1	4	
		(,	o.e		_	
			=695 – 696 (m)	A1	2	
	(b)		Angle of Dep. =	M1		
			tan <sup>-1</sup> 500 their 696			
			= 35.6 – 35.75	A1	2	
					12	

Page 4	ge 4 Mark Scheme		Paper
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10	(a)		20	В1				
			X					
	(b)		$\frac{25}{x+2}$	B1				
	(c)		$\frac{20}{x} - \frac{25}{x+2} = (\pm)1\frac{1}{2}$	M1				
			40(x+2)-50x=3x(x+2)	M1				
			$\Rightarrow 3x^2 + 16x - 80 = 0$	<b>A</b> 1			5	N.B. A.G
	(d)		For numerical $p \pm (or + or$	$-)\sqrt{q}$				If 'completing the
								square' used $\left(x + \frac{8}{3}\right)^2$ <b>B1</b>
			<i>p</i> = – 16 and <i>r</i> = 6 <i>q</i> = 1216 or	В1				33.7 <b>B1</b>
			$\sqrt{q} = 34.8 - 34.9$	В1				
			x = 3.145	B1	-8.479	В1	4	<b>SC1</b> for 3.1 – 3.2 <b>and</b> –8.4 to –8.5
	(e)		Time up $\frac{20}{3.145}$	М1	25	M1		Implied by 6.3
			3.145 11 h 13 min or 673 min	<b>A</b> 1	5.145		3 <b>12</b>	and 4.8
11	(a)	(i) (ii)	Reflection $ \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} $	B1 B1	<i>y</i> = – <i>x</i>	B1	3	
	(b)	(i) (ii)	$ \begin{pmatrix} (-1,3) \\ 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix} $	B1 M1				
			K is (2, -1)	<b>A1</b>			3	
		(iii)	Rotation 90° Anticlockwise	B1 B1			2	
		(iv)	(or 270° CW) (1 0)	B2			2	<b>SC1</b> for Reflection in <i>x</i>
		- *	$\begin{pmatrix} 0 & -1 \end{pmatrix}$					axis
	(c)	(i)	1:9	В1				Accept $\frac{2}{18}$ etc.
		(ii)	27	B1			2 <b>12</b>	18