

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:

- M 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 \surd 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**


Page 1	Mark Scheme	Syllabus	Paper
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1	(a)	(i)	$9 - 5p$	B1			1	SC1 for any incomplete (correct) factorisation $x = 5$ (or -5) implies M1
		(ii)	$3q^2 - 2r^2$	B1	$+5qr$	B1	2	
	(b)		$2(3t + 1)(3t - 1)$	B2			2	
	(c)	(i)	30	B1				
(ii)		$3x^2 = 75$	M1	$x = \pm 5$	A1		2	
(iii)		$y - 18 = 3x^2$	M1	$x = \sqrt{\frac{1}{3}(y - 18)}$	A1		2	
							10	
2	(a)	(i)	150 (g)	B1			1	Accept $\frac{9}{11}$ etc. SC1 for 11 : 9
		(ii)	450 : 550 or better	M1	9 : 11	A1	2	
		(iii)	$\frac{\text{'their' } 150 + 450}{1250 \text{ (figs)}}$	M1	48%	A1	2	
	(b)	(i)	(\$) 3.60	B1			1	
	(ii)	Idea that \$6.20 \equiv 80%	M1	\$7.75	A1		2	
							8	
3	(a)	(i)	$t = 69$	B1			1	N.B. Alt. method using pentagon.
		(ii)	$u = 57$	B1			1	
		(iii)	$x = 72$	B1			1	
		(iv)	$y = 15$	B1			1	
	(b)		$3z + 3 \times 105$	M1	$z = 135$	A1	2	
	(c)	(i)	12 (cm)	B1			1	
	(ii)	$\frac{18}{PS} = \frac{14}{18}$ (or $\frac{\text{his } 12}{18}$)	M1	15 (cm)	A1		2	
							9	
4	(a)	(i)	$\frac{20}{\cos 55}$	M1	34.8 – 35 (cm)	A1	2	
		(ii)	'their' $34.9 + 20 = 54.8 - 35$ (cm)	B1			1	
		(iii)	$20 \sin 55$	M1	16.3 – 16.4	A1	2	
	(b)		Arc of circle	B1	Centre C <u>or</u> 125° <u>or</u> $r = 20$	B1	2	
	(c)		$\frac{125}{360}$	M1	43.6 – 43.66	A1	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 Accept $\frac{8}{5}, 1\frac{3}{5}, 1\frac{6}{10}$ Allow B1 for any 1 correct. SC1 for 3 x their $\frac{4}{21}$ or for $\frac{8}{21}$	
	(ii)	Median = 1	B1		1		
	(iii)	Mean = $\frac{(0 \times 8) + (1 \times 5) + \dots}{8 + 5 + \dots}$	M1	= 1.6	A1		2
	(b) (i)	$p = \frac{1}{5}, q = 1, r = 0$ o.e	B2				2
	(ii)(a)	$\frac{2}{7}$	B1				1
	(b)	$\frac{4}{21}$	B1		1		
	(c)	$\frac{4}{7}$ or 'their' $\frac{4}{21} \times 3$	B2		2		
10							
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)	$10x + y$	B1		1		
	(ii)	$10x + y - (10y - x)$	M1	= $9x - 9y$	A1	2	
6							
7	(a)	$2x^2 = 500$	M1	15.8 – 15.82 (cm)	A1	2	
	(b)	$\frac{1}{3} \times 150 \times h = 500$	M1	10 (cm)	A1	2	
	(c)	$\frac{4}{3}\pi r^3 = 500$	M1	4.9 – 4.925 (cm)	A1	2	
	(d)	Use of R and $R + 1.5$ o.e	M1	or Use of $R + \frac{1.5}{2}$	M1		
		Area of x section = $\pi[(R + 1.5)^2 - R^2]$	A1	Area of x section = $2\pi\left[R + \frac{1.5}{2}\right] \times 1.5$	A1		
	Area of x section = $\frac{500}{6}$	B1					
	$R = 8 - 8.1$ (cm)	B1			4		
(e)	$\left(\frac{2}{5}\right)^3$	M1	32 (cm ³)	A1	2		
12							

Page 3	Mark Scheme	Syllabus	Paper
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8	(a)	Scales	S1	3	Lost for straight lines, incomplete, grossly thick		
		All 10 points correctly plotted (within 1 mm)	P1				
		Smooth curve through points (allow marginally incorrect points)	C1				
(b)	(i)	Negative value 0.32 to 0.45	T1 T1	3			
	(ii)	Rate at which water level is changing or fall of water level per hour o.e	R1				
(c)	(i)	4 (m)	B1	6	Allow (L1) for any st. line through (0,4) with –ve gradient		
	(ii)	Straight line through (0,4) and (6,2)	L2				
	(iii)	Their 2 – their 1.2	M1 75 – 85			A1	
	(iv)	5.7 – 5.9	B1			6	
					12		
9	(a)	(i)	$\frac{\sin D}{600} = \frac{\sin 118}{950}$	M1	$\Rightarrow \sin D = \frac{600 \sin 118}{950}$	4	All M and A marks available for any COMPLETE alternative methods.
				M1			
			$\hat{D} = 33.89 - 33.9 \Rightarrow$	A1			
			$B = 28.1 - 28.1$ 	A1			
	(ii)		$(CD^2 =) 1040^2 + 950^2 - (or+)(2) 1040.950. \cos 42$	M1	4	N.B. $\cos 42 = \frac{1040^2 + 950^2 - CD^2}{2 \times 1040 \times 950}$ gets the first M1	
			$CD^2 = 1040^2 + 950^2 - 2.1040.950 \cos 42$	M1			
	(iii)		$= 515000 - 516000$	A1	2		
			$CD = 716 - 719$ (m)	A1			
			$CN = 1040 \sin 42$	M1			
	(b)		o.e $= 695 - 696$ (m)	A1	2		
		Angle of Dep. =	M1				
		$\tan^{-1} \frac{500}{\text{their } 696}$	A1				
					2		
					12		

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