UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the June 2005 question paper

0580/0581 MATHEMATICS

0580/04, 0581/04   Paper 4 (Extended), maximum raw mark 130

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 initialy 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 and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Grade thresholds for Syllabus 0580/0581 (Mathematics) in the June 2... examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 4	130	93	54	33	n/a

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.

TYPES OF MARK

Most of the marks (those without prefixes, and 'B' marks) are given for accurate results, drawings or statements.

- **M** marks are given for a correct method.

- **B** marks are given for a correct statement or step.

- **A** marks are given for an accurate answer following a correct method.

ABBREVIATIONS

a.r.t.	Anything rounding to
b.o.d.	Benefit of the doubt has been given to the candidate
c.a.o.	Correct answer **only** (i.e. no 'follow through')
e.e.o.	Each error or omission
f.t	Follow through
i.s.w.	Ignore subsequent working
o.e.	Or equivalent
SC	Special case
s.o.i.	Seen or implied
ww	Without working
www	Without wrong working
√	Work followed through after an error: no further error made

June 2005

IGCSE

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MATHEMATICS

Paper 4 (Extended)</td></tr>
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1	**(a)**	$1.33 \times \dfrac{5}{7}$ o.e	**M1**	Implied by figures 95 in answer
		950 (kg) c.a.o.	**A2**	A1 for figs 95
	(b)	$765 \times \dfrac{9}{(9+8)}$ o.e.	**M1**	
		($) 405 c.a.o.	**A1**	
	(c)	$\dfrac{\text{their (b)}}{\text{their (a)}}$	**M1**	
		($) 0.43 or ($) 0.426	**A1√**	**f.t.** <u>their **(b)**</u> must be in dollars for A mark their **(a)**
	(d)(i)	$0.35 \times \dfrac{60}{100}$ o.e	**M1**	
		($) 0.21 c.a.o.	**A1**	
	(ii)	$0.35 \times \dfrac{100}{125}$ o.e	**M1**	
		($) 0.28 c.a.o	**A1**	0.26(25) is M0
			11	
2				All measurements ±2 mm or ±2 °
	(a)	AB = 12cm	**B1**	
	(b)	Perp. Bisector with arcs-2 sets for AB	**B2√**	SC1 if accurate without arcs
	(c)	Accurate trapezium c.a.o.	**B2**	dep**.** on B1 in **(a)** <u>and</u> at least SC1 in **(b)**. SC1 for DC = 9cm and parallel to AB
	(d)	Strict ft of their angle ABC (±2 °)	**B1√**	
	(e)	$(\tan B =) \quad \dfrac{7}{1.5}$	**B1**	or $(\sin B =) \dfrac{7}{\sqrt{(7^2+1.5^2)}}$ or $(\cos B =) \dfrac{1.5}{\sqrt{(7^2+1.5^2)}}$
		77.9 final answer	**B1**	Indep
	(f)(i)	Arc, centre D, radius 5 cm	**B1√**	No gaps in the trapezium, but condone extra
	(ii)	Bisector of their angle D with arcs	**B2√**	SC1 if accurate without arcs
	(iii)	Correct shading c.a.o.	**B1**	dep. on B1 in **(i)** <u>and</u> at least SC1 in **(ii)** and a correct trapezium
			12	

3			If choice of transformations in **(i)**, **(ii)** then lose the 1st two B marks in each p... e.g. 6 left and 1 up. Condone -6 1
(a)(i)	Translation (only) (T)	**B1**	
	$\begin{bmatrix} -6 \\ 1 \end{bmatrix}$ o.e.	**B1**	
(ii)	Reflection (only) (M)	**B1**	
	in $y = -x$ o.e.	**B1**	must be equation
(iii)	Enlargement (only) (E)	**B1**	
	Centre (0,6)	**B1**	
	Scale factor 3 o.e. seen	**B1**	
(iv)	Shear (H)	**B1**	
	x-axis ($y = 0$) invariant	**B1**	
	(Shear) factor 0.5 o.e. seen	**B1**	
(b)(i)	$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ o.e.	**B2**	SC1 for a correct column
(ii)	$\begin{bmatrix} 1 & 0.5 \\ 0 & 1 \end{bmatrix}$ o.e.	**B2**	SC1 for a correct column Allow embedded matrices in both answers
		14	
4 (a)	$p = 0.25$	**B1**	Must be seen. No feedback from graph.
	$q = 1$	**B1**	If not labelled, must be in order
	$r = 8$	**B1**	
(b)	Scales correct	**S1**	x from –2 to 4. y to accommodate their values.
	Their 7 points plotted correctly (within 1mm and in the correct square)	**P3√**	ft P2 for 6 points correct. P1 for 5 points correct.
	Smooth curve through all 7 points (1mm)	**C1√**	ft provided correct shape maintained
(c)	2.75 to 2.85	**B1**	
(d)	0	**B1**	
(e)	Tangent drawn at $x = 1.5$	**T1**	Not a chord and no daylight
	Uses <u>increase in y</u> (using scale) increase in x	**M1**	Dep on T1 or a near miss (not chord or clearly drawn at $x = 1$ or $x = 2$)
	1.7 to 2.2	**A1**	If correct method seen, condone any answer in range, even with a slight slip
(f)	Correct ruled straight line (complete for range 0 to 4)	**B2**	SC1 for freehand complete line or any ruled line of gradient 2 or y-intercept of 1 (<u>not</u> y=1)
(g)	Correct for theirs(±0.05) dep. on at least SC1 in **(f)**	**B2√**	SC1 if y-coordinate also given or x=0 also given (or both)
		17	

5 (a)(i)	$c - d$ final answer o.e.	**B1**	
(ii)	OD + DE <u>or</u> OC + their CD + DE o.e. d – 0.5c final answer o.e.	**M1** **A1**	Must be seen if answer incorrect
(iii)	OA + AB <u>or</u> OC + CB <u>or</u> OC + EO o.e. 1.5c – d final answer o.e.	**M1** **A1**	Must be seen if answer incorrect
(b)(i)	120	**B1**	If 90 then only method marks in **(iv)** available If 60 only method marks in **(ii)** and **(iv)** available
(ii)	0.5 × 8 × 8 sin120 o.e. art 27.7 (cm²) www	**M1** **A1**	e.g. perp. onto AC, then 8sin60 × 8cos60 (16√3)
(iii)	$8^2 + 8^2 - 2 \times 8 \times 8 \cos 120$ Square root of correct combination (√192 or 13.8$\left(\dfrac{5}{6}\right)$) art 13.9 (cm)(13.856406)	**M1** **M1** **A1**	** Dep on first M1. Errors must be due to slips, not incorrect combination (8√3) ** Alternative methods e.g. perp onto AC, then 8sin60 M1 ×2 M1 Sine Rule Implicit M1 Explicit M1
(iv)	ABC (×2) + OACD o.e. their **(ii)** × 2 + their **(iii)** × 8 166 to 167 (cm²) c.a.o.	**M1** **M1** **A1**	Alt meth. 6 × ABX (X is centre) <u>or</u> 6 × ABC <u>etc.</u> 6 × [0.5 × 8 × 8 sin60] <u>or</u> their **(ii)** × 6 <u>etc.</u> (96√3)
		14	

6	**(a)**	Vol of cyl.= $\pi \times 0.35^2 \times 16.5$ (6.3…)	**M1**	<u>USE OF RADIUS = 0.7</u> Use of radius = 0.7 loses all marks in (a)	
		Vol of cone = π x $\dfrac{0.35^2}{3}$ x 1.5 (0.19...)	**M1**	After that they can revert to 0.35 without penalty	
		a.r.t. 6.54 (cm^3)	**A1**	Any later use of 0.7 after 0.35 penalty 2 from the marks gained using 0.7	
	(b)(i)	4.2	**B1**	8.4	**B1**
		1.4	**B1**	2.8	**B1**
	(ii)	18 × their 4.2 × their 1.4	**M1**	18 × their 8.4 × their 2.8	**M1**
		106 (cm^3) (105.84)	**A1**	423 (cm^3) (423.36)	**A1**

	(iii)	12 × <u>their **(a)**</u> ×100
		   their **(b)(ii)**
			M1	<u>12 × their **(a)**</u> ×100
				   their **(b)(ii)**
					M1

		74.(0) to 74.2 (%) c.a.o.	**A1**	74.1 to 74.3 (%)	**A1**
	(c)(i)	(l =) √($1.5^2 + 0.35^2$)	**M1**	(l =) √($1.5^2 + 0.7^2$)	**M1**
		1.54 (cm)	**A1**	1.66 (cm)	**A1**
	(ii)	Circle = $\pi \times 0.35^2$	**M1**	Circle = $\pi \times 0.7^2$	**M1**
		Cylinder = 2 × π × 0.35 × 16.5	**M1**	Cylinder = 2 × π × 0.7 × 16.5	**M1**
		Cone = π × 0.35 × their **(c)(i)**	**M1**	Cone = π × 0.7 × their **(c)(i)**	**M1**
		Any 2 correct areas (a.r.t. 0.385 a.r.t. 36.3 a.r.t. 1.69) 0.1225 π 11.55 π 0.539 π	**B2**	Any 2 correct areas (a.r.t. 1.54 72.5 to 72.6 a.r.t. 3.65) 0.49 π 23.1 π 1.162 π	**B2**
		38.3 to 38.4 (cm^2) c.a.o.	**A1**	77.7 to 77.8 (cm^2)	**A1**
			17		

7 (a)(i)	Median 46.5	B1	
(ii)	IQR 9.5 www	B2	SC1 for 42 or 51.5 seen
(iii)	48	B2	SC1 for 102 seen
(b)(i)	n = 32	B1	
(ii)	Midpts 32.5, 37.5, 42.5, 47.5, 52.5, 57.5 10x32.5 + 17x37.5 + 33x42.5 + 42x47.5 + their 32x52.5 + 16x57.5 [6960] $\sum fx$ / 150 46.4	M1 M1* M1 A1	At least 5 correct s.o.i. Dep on first M1 or midpoints ±0.5 Allow 1 more slip Dep on 2ⁿᵈ M1*

(c)	Horizontal Scale correct
	
	3 correct widths on their scale (f.t)
	For each block of correct width
	        2.7 cm
	
	        7.1(3) or 7.2 cm
	        3.2 cm
		S1
		
		W1√
		
		H1
		
		H1
		H1
			Implied by correct use. Ignore vertical scale
			
			no gaps
			
			For scale error double or half, award H1, H1, H1
			for correct f.t heights
			After H0, SC1 for 3 correct frequency densities written or for heights 2.7cm, 7.1cm and 3.2cm drawn on doubled/ halved horizontal scale.

		15	
8 (a)	$(x – 3)(x – 1)$ [= 0] 1 and 3	M1 A1	$\frac{4 \pm \sqrt{[(-4)^2 - 4.1.3]}}{2}$ or $(x - 2^2)$ = 1 or better
(b)	Correct first step of rearrangement $\dfrac{x+1}{2}$ o.e.	M1 A1	e.g. $y + 1 = 2x$ or $x + 1 = 2y$ or better not for x = ( )
(c)	$x^2 – 6x + 4 = 0$ $\dfrac{p \pm \sqrt{q}}{r}$ with p = 6 and r = 2 and $q = (-6)^2 – 4.1.4$ o.e. or 20 5.24 c.a.o. www 0.76 c.a.o. www	MA1 M1√ M1√ A1	Can be implied by later work (method marks) f.t. if in the form $ax^2 + bx + c$ (= 0) with $a \neq 0$ [$(x-3)^2 - 5 = 0$ M1 then $x = (\pm)\sqrt{5} + 3$ M1 is the equivalent for completing the square.] Indep. SC1 for both answers 'correct' but not to 2 dp (5.236067977 , 0.763932022). Can be truncated or correctly rounded
(d)	29	B2	SC1 for [$f(-2)$ =] 15 seen or $2x^2 -8x +5$ o.e seen
(e)	$(2x – 1)^2 – 4(2x – 1) + 3$ $4x^2 – 12x + 8$ or correctly factorised final answer	M1 A2	 After A0, SC1 for $4x^2 - 12x + 8$ seen
		14	

9 (a)	$x + y \leq 12$ o.e	B1	$x + y < 13$
(b)	$y \geq 4$ o.e.	B1	$y > 3$
(c)	Scales correct – full length	S1	
(d)	$x + y = 12$ ruled and long enough $y = 4$ ruled and long enough $5x + 3y = 45$ ruled and long enough (1 mm at (9, 0) and (0, 15) if extended) <u>Unwanted</u> regions shaded	L1 L1 B2 B2√	or broken line $x + y = 13$ or broken line $y = 3$. F.t from $x \geq 4$ only in **(b)** SC1 for either point correct SC1 for wanted regions shaded f.t. from <u>minor</u> slips in the lines that do not compromise the shape and position of the triangle or from $x \geq 4$ in **(b)** and $x = 4$ drawn
(e)	6 super, 5 mini <u>and</u> 5 super, 7 mini (no extras) Can write as (6, 5) and (5, 7)	B3	SC2 for 1 correct and no more than 1 wrong SC1 for any point(s) in their region selected (enclosed by 3 lines or 2 lines + 1 axis)
(f)(i)	(7, 4) or (6, 5) s.o.i. ($) 274 ($) 260	M1 A1 A1	 If 0 scored, SC1 for evidence of $30x + 16y$ written or used
(f)(ii)	($) 94 c.a.o.	B1	
		16	