MARK SCHEME for the November 2004 question papers

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 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 November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 0580/0581 (Mathematics) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 4	130	85	49	30	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
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

November 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 130

SYLLABUS/COMPONENT: 0580/04, 0581/04

MATHEMATICS

Paper 4
Extended

UNIVERSITY of CAMBRIDGE
International Examinations

1 (a)	15 : 13 or 13 : 15	B1	Allow $n : 1$, or $1 : n$, where n is 15/13, 13/15, 1.15 (3 or 4), 0.866 (6 or 7)
(b)	$0.28 \times 45\,000$ o.e. **12 600**	M1 A1	
(c)	$\dfrac{16\,000}{39\,000} \times 100$ o.e. **41.0** or better	M1 A1	Condone 41 41.0 (2 or 3)
(d)	$\dfrac{45\,000}{2.25}$ o.e. **20 000**	M1 A1	SC1 for 36 000
(e)	$\dfrac{5}{30} \times 84\,000$ o.e **14 000**	M1 A1	Their attempt at 45 000 + 39 000 and their '30'
			[9]
2 (a)(i)	**p = 12** **q = 1.5** **r = 1.2**	B1 B1 B1	If not labelled, mark in order given
(ii)	Scales correct	S1	To 11 horizontally and 12 √ vertically are possible
	12 correct points plotted within 1 mm	P3√	P2√ for 10 or 11 correct. P1√ for 8 or 9 correct.
	Smooth curve through all points	C1	Within ½ small square, none ruled, correct shape.
(iii)	Tangent drawn at (3, 3)	T1	Allow a parallel line below curve, *slight* chord, but not an intended chord
	Attempts $\dfrac{increase\ in\ y}{increase\ in\ x}$ for their tangent	M1	dep. on T1. If no working must fit tangent acc (0.1) for 1 cm horizontally
	–0.6 to –1.0 www	A1	If correct method shown allow answer in range even with slight slip.
(b)	Correct straight line ruled and complete for range 0 to 8	B2	B1 for any straight ruled line with y-intercept 8 (except $y = 8$) **or** gradient –1
(c)(i)	$\dfrac{12}{x+1} = 8 - x$ $12 = 8x + 8 - x^2 - x$ o.e. seen $x^2 - 7x + 4 = 0$	M1 E1	Must be seen to expand the brackets correctly
(ii)	$x = $ **0.5, 0.6, 0.7 or 0.8**	B1	Must be correct for their graph (1 mm)

	or 6.2, 6.3, 6.4 or 6.5	B1	B1 maximum for use of formula to get 6.4 **and** 0.6 unless convinced it is a check. Coordinates get B0 **[17]**
3 (a)	$\pi \times 40^2 \times 110$ **552 600 to 553 000**	M1 A1	or 0.553 **m³**
(b)	1.6×14 $\dfrac{their(a)}{1.6 \times 14}$ **6 hours 51 minutes**	M1 M1 A2	(22.4) Accept alternate methods **Dep**. correct answer (24 687.5 secs = 411..mins) A1 for 411..mins or 6.85 to 6.86 hrs After A0, SC1 for ÷ 3 600 s.o.i. (6 hrs 52 mins)
(c)	70×100^2 their (a) $\div (70 \times 100^2)$ **8** www	M1 M1 A2	Dep. could be 0.553 ÷ 70 After A0, SC1 for digits 78…, 79 or 8(0) **[10]**
4 (a)	Correct scales Correct triangle	S1 T1	From –8 to 8 for x and y (Acc is 2 mm)
(b)	A_1(–7, 5) B_1 (–4, 5) C_1 (–4, 7)	TR2√	SC1 for any translation
(c)	A_2 (2, –4) B_2 (5, –4) C_2 (5, –6)	R2√	SC1√ for reflection in $x = –1$ or $y = 1$
(d)	A_3 (–2, 4) B_3 (4, 4) C_3 (4, 8)	E2√	SC1 for enlargement SF2 or correct ray method but o.o.r.
(e)(i)	A_4 (–2, –2) B_4 (–2, –5) C_4 (–4, –5)	B2√	SC1√ for 2 correct points
(ii)	**Reflection** only in line $y = –x$ o.e.	B1 B1	 with no extras
(f)(i)	A_5 (3, 2) B_5 (7.5, 2) C_5 (7.5, 4)	B2√	SC1√ for 2 correct points Or stretch factor 1.5 with x-axis invariant A_5 (2, 3) B_5 (5, 3) C_5 (5, 6)
(ii)	$\begin{pmatrix} 1.5 & 0 \\ 0 & 1 \end{pmatrix}$	B2	SC1 for a correct column in correct position **[16]**
5 (a)(i)	$(\cos A =)\ \dfrac{40^2 + 70^2 - 45^2}{2 \times 40 \times 70}$ (0.7991) **37**	M2 E1	4 475/ 5 600 M1 for correct implicit form. Accept complete alternate methods. Accept 36.9–37
(ii)	**14** to **14.1** $0.5 \times 40 \times 70 \times \sin36.9 - 37$ o.e. **841.3** to **843** www	B1 M2 A1	 Allow complete alternative methods ww3

(b)(i)	70sin51 o.e. (= 54.4)	**E2**	M1 for $\dfrac{p}{70}$ = sin51 o.e.
(ii)	$\dfrac{q}{70}$ = cos51 o.e.	**M1**	Alt. method – Pythagoras'
	44.1 or better	**A1**	ww2 (44.0524…)
(c)	angle D = 94	**B1**	
	(BD =) $\dfrac{45\sin 54}{\sin 180 - 86}$	**M2**	M1 for $\dfrac{BD}{\sin 54} = \dfrac{45}{\sin 180 - 86}$
	a.r.t. **36.5** c.s.o	**A1**	ww4 **[15]**
6 (a)(i)	$\dfrac{(0\,\text{or}\,3) + 10 + 24 + 27 + 4x}{34 + x}$ (2.125)	**M2**	M1 for (0 or 3) + 10 + 24 + 27 + 4x.
	61 + 4x = 2.125 (34 + x) o.e.	**M1**	Dep. –deals with the fraction correctly
	6	**A1**	www4 or T and I gets 4
(ii)	**1** strict f.t.	**B1√**	1 for $x \le 18$, 2 for $19 \le x \le 66$ If no answer in **(i)** accept 1
(b)(i)	**(a)** **21**	**B1**	
	(b) **30**	**B1**	
(ii)	**1.4**	**B2**	M1 for 42 ÷30 or 1 cm^2 = 5 seen
(iii)	$\dfrac{(10.5 + '30'.15 + 25.22.5 + '21'.27.5 + 42.45)}{'128'}$	**M2**	(3 530 for $\sum fx$) f.t. values 21 and 30 from **(b)(i)** Allow 1 slip in figures for M2 M1 for 4 of mid values 5, 15, 22.5, 27.5, 45 **or** method correct but mid values up to ± 0.5.
	27.57 to **27.6** c.s.o	**A1**	If 0 scored, SC1√ for '128' seen **[12]**
7 (a)(i)	**5**	**B1**	
(ii)	$x^2 - 2x - 3 (= 0)$	**M1**	Implied by correct factors or use of formula
	$x = $ **–1 and 3**	**A1**	If A0, SC1 for $(x - 3)(x + 1)$ or $\dfrac{2 \pm \sqrt{(-2)^2 - 4.1 - 3}}{2.1}$
	(–1, 0) and (3, 0)	**A1**	
(iii)	**(1, –4)**	**B2**	Or clear 1 and –4 in correct order B1 for either correct value
(b)(i)	Reflection in x-axis or turns upside down o.e.	**B1**	Accept correct sketches in both cases
(ii)	Correct statement referring to (0, 0) as **minimum value**	**B1**	
(c)(i)	**0**	**B1**	

(ii)	$3^2a + 3b = 0$ **and** $4^2a + 4b = 8$ o.e.	M1	e.g. accept equates coefficients (2 out of 3 terms) **and** attempts to subtract their equations
	Attempts to eliminate a's or b's	M1	
	$a = 2$	A1	
	$b = -6$	A1	www4
			[13]
8 (a)(i)	**32.2**	B1	
(ii)	**550**	B1	
(iii)	**(a)** $2 \times 9.2 + 1.6 \times 8$ o.e.	M1	
	31.2	A1	If 0 scored SC1 for answer 3120
	(b) **8.7** or better	B1√	Their $31.2 \div 3.6$ correctly evaluated 2 s.f. (or better) (8.6 r), accept correct fraction
(b)(i)	figs $395 \div 25$	M1	Implied by figs 158 www
	$\times 100$ indep	M1	
	15.8	A1	www3
(ii)	figs 128×25^2	M1	
	80 000 www	A1	Ignore subsequent unit conversions
(iii)	figs $250 \div 25^3$	M1	Implied by figs 16
	$\times 1000$ indep	M1	
	16	A1	www3
			[13]
9 (a)(i)	$2 - 3x = 7 - x$ o.e.	M1	
	$-$**2.5** o.e.	A1	e.g. 5/–2
(ii)	Correct first step of rearrangement	M1	e.g. $y - 2 = 3x$ o.e. or division by 3 or $(2 - y)/3$
	$\dfrac{2-x}{3}$ o.e.	A1	SC1 for inverse of $7 - x$ (from f(x) = $7 - x$)
(iii)	**26** www	B3	B1 for gf(2) = 16 www **and** B1 for fg(2) = –10 www in correct order.
(iv)	$2 - 3x^2$	B1	Final answer
(b)(i)	**4**	B1	
(ii)	$-\dfrac{1}{27}$	B1	Accept 1/–27
(iii)	$7.5^{7.5}$	M1	Implied by figs 36.. to 37..
	3.65 to 3.66 $\times$ 10^6	A1	or 3.7×10^6
(iv)	<u>Square root</u> of a negative number o.e.	B1	Must make reference to square root or <u>square</u>
(v)	**5**	B1	
			[14]

10 (a)(i)	Reasonable rhombus sketched Rhombus	**1** **1**	
(ii)	Reasonable kite sketched Kite	**1** **1**	If **(i)** and **(ii)** reversed give SC2 if completely correct otherwise
(b)	**2x** **180 – 2x** o.e.	**1** **1**	Ignore repeats but not choice Ignore repeats but not choice
(c)	$0.5. \times 12 \times 20$ o.e. **120**	**M1** **A1**	
(d)	Uses Pythagoras' or considers a correct triangle/rhombus area equation **with variables defined** **13** www	**M1** **A2**	Equation f.t. from **(c)** Accept algebraic Pythagoras' A1 for 10 **and** 24 as length of diagonals soi e.g. by 5 and 12 as shorter lengths of right-angled triangle. Implies M1 if no working shown ww3 **[11]**