MARK SCHEME for the October/November 2006 question paper

0580 and 0581 MATHEMATICS

0580/04 and 0581/04   Paper 4, 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 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.

1(a)	$800 \div (7 + 5 + 4)$	M1	Implied by 50
	their $50 \times$ any one of 7, 5 or 4	M1	Dep
	350, 250, 200	A1	www 3 In order or correctly matched
(b)	100 or 250	B1	May be implied in next step
	$\dfrac{their\,250 \times 5 \times 2}{100}$ seen	M1	could be 100, 350 etc. not 2/7 or 5/7
	275 cao	A1	www 3
(c)	$0.8 \times$ their 250 in (a) oe	M1	
	200	A1ft	www 2 ft acc to nearest cent if approp.
(d)	275 or their (b) :200 or their (c) : 100	M1	
	11 : 8 : 4 or 2.75 : 2 : 1 cao	A1	www 2 In order or correctly matched
(e)	100×1.05^2	M1	
	110.25 cao	A1	After M0 allow SC1 for10.25 final answer
			12
2(a)	$1400^2 + 1600^2 - 2 \times 1400 \times 1600 \cos 13$ (154822)	M2	M1 for correct implicit cosine rule
	square root of correct combination	M1	Dep (wrong combo – 38975)
	393 to 393.5	A1	www 4
(b)	(H=) 49 seen	B1	May be implied by next step
	$\dfrac{WJ}{\sin(their\,49)} = \dfrac{1600}{\sin 95}$	M1	Implicit and correct – may be implied by next step (not for 36 used)
	$WJ = \dfrac{1600 \sin(their\,49)}{\sin 95}$	M1	Dep. Explicit and correct
	1210 or art1212 cao	A1	www4
(c)	$0.5 \times 1400 \times 1600 \sin 13$ (251945) + $0.5 \times 1600 \times their$ (b)$\sin 36$ (569916) oe	M2	Allow M1 for one correct method for one triangle
	820900 to 822000 cao	A1	www 3
(d)(i)	(0)73 cao	B1	
(ii)	289 cao	B1	
(e)	(n =) **20 000 000** seen final ans.	B2	SC1 for 1 : figs 2 as final ans
			15
3(a)	$0.5(1.1 + 1.4) \times 0.7$ oe	M1	M marks available for 2sf answers ww here
	0.875 cao	A1	www 2
(b)	their (a) $\times$ 500	M1	
	437.5 or 438	A1ft	www 2
(c)	art 2.1×10^3	B2ft	*their* 437.5 × 4.8 in s.f., B1ft for art '2 100'
(d)	art 2.1×10^9 o.e	B1ft	their (c) $\times 10^6$ correct. Accept art 2 100 000 000
			Accept standard form answers correct to 2 sf
(e)	$\pi \times 0.2^2 \times 500$	M1	
	62.8 to 62.84 cao	A1	www 2
(f)	their (b) – their (e)	M1	Provided positive answer
	$\dfrac{their(b) - their(e)}{their(b)} \times 100$ o.e.	M1	dep
	85.6 to 85.7 cao	A1	www 3 After M0, SC1 for 14.3 to 14.4
			12

4(a)	$-6.1(11..)$, 5, 11.9 ($11.88...$)	1,1,1	
(b)	Correct scales	S1	-3 to 3 for x, and -10 to their max
(c)	16 correct points	P3ft	P2ft for 13 to 15 correct (in correct square) P1ft for 10 to 12 correct
	smooth curves through 14 points Ignoring $x = \pm 0.3$	C1ft	Correct shape, not ruled, within ½ small square (curves could be joined)
	Graph does not cross the y-axis	B1	Indep but needs 2 'curves'.
(d)(i)	$0.45 \leq x \leq 0.5$	B1	
(ii)	$-2.4 \leq x \leq -2.1$	1	
	$-0.5 \leq x \leq -0.4$,	1	
	$0.3 \leq x \leq 0.4$	1	If 0 scored, SC1 for evidence of $f(x) = -4$
(e)	$g(x) = 3x + 3$ correct, ruled, full range (1mm acc at ends)	L2	Allow SC1 for any **one of** correct but short, gradient of 3, y-intercept 3 on sloping line, 'good' freehand.
(f)(i)	Gets closer o.e	B1	Any correct comment isw dep on $g(x)$ correct or freehand
(ii)	Answer rounds to **3.00**	B1	17
5(a)(i)	$s = \frac{1}{3}$, $t = \frac{1}{4}$, $u = \frac{5}{6}$	1,1,1	All correctly placed on tree or clearly indicated
(ii)	$\frac{2}{3} \times \frac{3}{4}$	M1	Accept probabilities as fractions/decimals/%
	$\frac{1}{2}$ oe cao	A1	-1 once for words or 2 sf, do not accept ratios i.s. cancelling after correct answer.
(iii)	$\frac{2}{3} \times their\, \frac{1}{4} + their\, \frac{1}{3} \times their\, \frac{5}{6}$	M1	Follow through method provided $0 < P < 1$
	$\frac{4}{9}$ oe cao	A1	www 2 (0.444)
(b)(i)	$\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}$	M1	
	$\frac{1}{27}$	A1	www 2 (0.037)
(ii)	$1 - \left(\frac{2}{3}\right)^3$ o.e.	M1	
	$\frac{19}{27}$	A1	www 2 (0.704)
(c)(i)	$\left(\frac{3}{4}\right)^3 \times \frac{1}{4}$	M1	
	$\frac{27}{256}$	A1	www2 (0.105)
(ii)	$\left(\frac{3}{4}\right)^{n-1} \times \frac{1}{4}$ oe	B1	14

6 (a)(i)	$-p + q$	B1	Accept any form for correct simplified answers
(ii)	$-\frac{2}{3}p + \frac{2}{3}q$	B1ft	f.t. 2/3 of their (a)(i)
(iii)	$-q + -\frac{2}{3}p + \frac{2}{3}q$ oe	M1	$-q$ + their (ii) or $-p + -\frac{1}{2}$ their (ii)
	$-\frac{2}{3}p - \frac{1}{3}q$	A1	
(iv)	$p + -\frac{2}{3}p + \frac{2}{3}q$ oe	M1	p + their (ii) or $q + -\frac{1}{2}$ their (ii),
			or $p + q$ + their (iii)
	$\frac{1}{3}p + \frac{2}{3}q$	A1	Accept in column vector
(b)(i)	$(4, -2)$	B1	
(ii)	$\begin{pmatrix} -3 \\ 4 \end{pmatrix}$	B1	
(c)(i)	Rotation only,	B1	
	90° clockwise oe,	B1	e.g. -90° or 270°
	centre (0 ,0)	B1	
(ii)	$(3, -5)$	B1	
(d)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	B2	B1 each correct column
			14
7(a)(i)	$\frac{54+21+8a+45}{9+3+a+5} = 7.2$ oe	M1	Accept products shown
	$120 + 8a = 122.4 + 7.2a$ oe	M1	Dep on previous M1 and a denominator of the form integer + a - deals with fraction correctly but not where n used in denominator.
	$(a) = 3$ cao	A1	www 3
(ii)	20	B1ft	17 + their (a), provided (a) is positive integer
(iii)	7 cao	B1	
(b)(i)	14 to 14.2 cao	B1	
(ii)	6 cao	B1	
(iii)	28 cao	B1	
(iv)	22	B1ft	their (iii) – their (ii) dep on both values being less than 50 and (iii) is greater than (ii)
(v)	31.5 to 32	B1	
(vi)	60 cao	B1	
(c)(i)	150	B1	
(ii)	125	B1	
(iii)	Mid values 25, 62.5, 87.5	M1	
	('150' × 25 + 100 × 62.5 + '125' × 87.5)	M1	dep
			Not for 3 or 4 or 5 used as frequencies
	(20937.5) ÷ '375'	M1	dep on 2nd M1
	55.8 (3...) cao	A1	www4
			17

8(a)(i)	$2\pi \times 5 \times 9 + 2\pi \times 5^2$	M1	
	439.8 to 440	A1	www2
(ii)	$\dfrac{A - 2\pi r^2}{2\pi r}$ o.e. final ans	M1	for correct first step
		M1	ft for correct second step
(iii)	$\dfrac{377 - 2\pi \times 6^2}{2\pi \times 6}$ or $\dfrac{377}{2\pi \times 6} - 6$	M1	correct or ft their (ii) Could restart but must get to explicit stage
	3.99 to 4.01	A1	may be embedded www3
(iv)	$2\pi r \times r + 2\pi r^2 = 1200$	M1	
	$4\pi r^2 = 1200$ or better	A1	
	9.77 to 9.78	A1	may be embedded www3
(b)(i)	**134**	B1	
(ii)	$\dfrac{x}{45}$	B1	Not '$x = x/45$ but allow other letter
(iii)	$\dfrac{x-75}{48}$	B1	If 0 scored for both allow SC1 for 0.45 and 0.48 used but otherwise correct Allow SC1 for '+7' o.e. in equation
(iv)	'$\dfrac{x}{45}$' $- 7 =$ '$\dfrac{x-75}{48}$'	M2	
	$48x - 15120 = 45x - 3375$ oe	M1	Correctly clearing fractions. Dep on M2 or SC1 and an equation with 2 fractions
	3915 cao	A1	www 4 16
9(a)	$x + y (....)12$	B1	
	$x(....)4$	B1	
	both inequality signs correct $\leq$ $\geq$	B1	Dep on first B1 and either 2nd B1 or $y \geq 4$ given
(b)	Correct scales	S1	0 to 12 possible for both
(c)	$x + y = 12$ ruled, sufficiently long	L1	1mm accuracy (6, 6) and (4, 8) check
	$x = 4$ ruled, sufficiently long	L1	Allow L1 ft **only** from $y(....)4$ in (a).
	$y = x$ ruled, sufficiently long	L1	
	Correct shading out of three regions cao	B2ft	SC1 for wanted regions shaded. ft from minor slips in the lines that do not compromise the shape and position of the triangle or for quadrilateral if $y \geq 4$ in (a) and $y = 4$ drawn
(d)(i)	from (4, 4)	M1	If quadrilateral from $y = 4$ allow (0, 4) for M1 or ft lowest value from minor slip triangle
(ii)	**18** cao	A1	
	from (6, 6)	M1	or follow through highest value from minor slip triangle
	27 cao	A1	If answers reversed and otherwise correct allow SC2 13