

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.

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1(a)	$800 \div (7 + 5 + 4)$ their 50 \times any one of 7, 5 or 4 350, 250, 200	M1 M1 A1 B1	Implied by 50 Dep www 3 In order or correctly matched May be implied in next step
(b)	100 or 250 $\frac{\text{their } 250 \times 5 \times 2}{100}$ seen 275 cao	M1 A1	could be 100, 350 etc. not 2/7 or 5/7 www 3
(c)	$0.8 \times \text{their } 250$ in (a) oe 200	M1	
(d)	275 or their (b) : 200 or their (c) : 100 11 : 8 : 4 or 2.75 : 2 : 1 cao	A1ft M1	www 2 ft acc to nearest cent if approp.
(e)	100×1.05^2 110.25 cao	A1 M1 A1	www 2 In order or correctly matched After M0 allow SC1 for 10.25 final answer
12			
2(a)	$1400^2 + 1600^2 - 2 \times 1400 \times 1600 \cos 13$ (154822) square root of correct combination 393 to 393.5	M2 M1 A1	M1 for correct implicit cosine rule Dep (wrong combo – 38975) www 4
(b)	(H=) 49 seen $\frac{WJ}{\sin(\text{their } 49)} = \frac{1600}{\sin 95}$ $WJ = \frac{1600 \sin(\text{their } 49)}{\sin 95}$ 1210 or art 1212 cao	B1 M1 M1 A1	May be implied by next step Implicit and correct – may be implied by next step (not for 36 used) Dep. Explicit and correct www 4
(c)	$0.5 \times 1400 \times 1600 \sin 13$ (251945) + $0.5 \times 1600 \times \text{their (b)} \sin 36$ (569916) oe 820900 to 822000 cao	M2 A1	Allow M1 for one correct method for one triangle 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 0.875 cao	M1 A1	M marks available for 2sf answers ww here www 2
(b)	their (a) \times 500 437.5 or 438	M1 A1ft	www 2
(c)	art 2.1×10^3	B2ft	their 437.5 \times 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
(e)	$\pi \times 0.2^2 \times 500$ 62.8 to 62.84 cao	M1 A1	Accept standard form answers correct to 2 sf www 2
(f)	their (b) – their (e) $\frac{\text{their (b)} - \text{their (e)}}{\text{their (b)}} \times 100$ o.e. 85.6 to 85.7 cao	M1 M1 A1	Provided positive answer dep www 3 After M0, SC1 for 14.3 to 14.4
12			

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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 $x = \pm 0.3$ Graph does not cross the y-axis	C1ft	Correct shape, not ruled, within $\frac{1}{2}$ small square (curves could be joined)
		B1	Indep but needs 2 'curves'.
(d)(i)	$0.45 \leq x \leq 0.5$	B1	
(ii)	$-2.4 \leq x \leq -2.1$ $-0.5 \leq x \leq -0.4$ $0.3 \leq x \leq 0.4$	1 1 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)	$\frac{2}{3} \times \frac{3}{4}$ $\frac{1}{2}$ oe cao	M1 A1	Accept probabilities as fractions/decimals/% -1 once for words or 2 sf, do not accept ratios i.s. cancelling after correct answer.
(iii)	$\frac{2}{3} \times \text{their } \frac{1}{4} + \text{their } \frac{1}{3} \times \text{their } \frac{5}{6}$ $\frac{4}{9}$ oe cao	M1 A1	Follow through method provided $0 < P < 1$ www 2 (0.444)
(b)(i)	$\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3}$ $\frac{1}{27}$	M1 A1	www 2 (0.037)
(ii)	$1 - \left(\frac{2}{3}\right)^3$ o.e. $\frac{19}{27}$	M1 A1	www 2 (0.704)
(c)(i)	$\left(\frac{3}{4}\right)^3 \times \frac{1}{4}$ $\frac{27}{256}$	M1 A1	www2 (0.105)
(ii)	$\left(\frac{3}{4}\right)^{n-1} \times \frac{1}{4}$ oe	B1	
14			

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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),	
	$\frac{1}{3}p + \frac{2}{3}q$	A1	or $p + q$ + their (iii) Accept in column vector	
(b)(i)	(4, -2)	B1		
(ii)	$\begin{pmatrix} -3 \\ 4 \end{pmatrix}$	B1		
(c)(i)	Rotation only, 90° clockwise oe, centre (0,0)	B1 B1 B1	e.g. -90° or 270°	
(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.	
(ii)	(a) = 3	A1	www 3	
(iii)	20	B1ft	17 + their (a), provided (a) is positive integer	
	7	B1		
(b)(i)	14 to 14.2	B1		
(ii)	6	B1		
(iii)	28	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	B1		
(c)(i)	150	B1		
(ii)	125	B1		
(iii)	Mid values 25, 62.5, 87.5 (‘150’ × 25 + 100 × 62.5 + ‘125’ × 87.5) (20937.5) ÷ ‘375’ 55.8 (3...)	M1 M1 M1 A1	dep Not for 3 or 4 or 5 used as frequencies dep on 2 nd M1 www4	17

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