

**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 <b>350, 250, 200</b>	<b>M1</b> Implied by 50 <b>M1</b> Dep <b>A1</b> www 3 In order or correctly matched <b>B1</b> May be implied in next step	<b>12</b>
(b)	$\frac{100 \text{ or } 250}{\text{their } 250 \times 5 \times 2}$ seen <b>275 cao</b>	<b>M1</b> could be 100, 350 etc. not 2/7 or 5/7 <b>A1</b> www 3	
(c)	$0.8 \times \text{their } 250$ in (a) oe <b>200</b>	<b>M1</b>	
(d)	$275$ or their (b) : $200$ or their (c) : $100$ <b>11 : 8 : 4</b> or <b>2.75 : 2 : 1</b> cao	<b>A1ft</b> www 2 ft acc to nearest cent if approp. <b>M1</b>	
(e)	$100 \times 1.05^2$ <b>110.25</b> cao	<b>A1</b> www 2 In order or correctly matched <b>M1</b> <b>A1</b> After M0 allow SC1 for 10.25 final answer	
2(a)	$1400^2 + 1600^2 - 2 \times 1400 \times 1600 \cos 13$ (154822) square root of correct combination <b>393 to 393.5</b>	<b>M2</b> M1 for correct implicit cosine rule <b>M1</b> Dep (wrong combo – 38975) <b>A1</b> www 4 <b>B1</b> May be implied by next step	<b>15</b>
(b)	$(H=) 49$ seen $\frac{WJ}{\sin(\text{their } 49)} = \frac{1600}{\sin 95}$ $WJ = \frac{1600 \sin(\text{their } 49)}{\sin 95}$ <b>1210 or art 1212</b> cao	<b>M1</b> Implicit and correct – may be implied by next step (not for 36 used) <b>M1</b> Dep. Explicit and correct <b>A1</b> www 4	
(c)	$0.5 \times 1400 \times 1600 \sin 13$ (251945) + $0.5 \times 1600 \times \text{their (b)} \sin 36$ (569916) oe <b>820900 to 822000</b> cao	<b>M2</b> Allow M1 for one correct method for one triangle <b>A1</b> www 3	
(d)(i)	(0)73 cao	<b>B1</b>	
(ii)	289 cao	<b>B1</b>	
(e)	(n =) 20 000 000 seen final ans.	<b>B2</b> SC1 for 1 : figs 2 as final ans	
3(a)	$0.5(1.1 + 1.4) \times 0.7$ oe <b>0.875</b> cao	<b>M1</b> M marks available for 2sf answers ww here <b>A1</b> www 2	<b>12</b>
(b)	their (a) $\times 500$ <b>437.5 or 438</b>	<b>M1</b> <b>A1ft</b> www 2	
(c)	art $2.1 \times 10^3$	<b>B2ft</b> their $437.5 \times 4.8$ in s.f., B1ft for art '2 100'	
(d)	art $2.1 \times 10^9$ o.e.	<b>B1ft</b> their (c) $\times 10^6$ correct. Accept art 2 100 000 000	
(e)	$\pi \times 0.2^2 \times 500$ <b>62.8 to 62.84</b> cao	Accept standard form answers correct to 2 sf <b>M1</b> <b>A1</b> www 2	
(f)	their (b) – their (e) $\frac{\text{their (b)} - \text{their (e)}}{\text{their (b)}} \times 100$ o.e. <b>85.6 to 85.7</b> cao	<b>M1</b> Provided positive answer <b>M1</b> dep <b>A1</b> www 3 After M0, SC1 for 14.3 to 14.4	

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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 <b>one of</b> 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	
<b>17</b>			
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	
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(a)(i)	$-p + q$		<b>B1</b>	Accept any form for correct simplified answers
(ii)	$-\frac{2}{3}p + \frac{2}{3}q$		<b>B1ft</b>	f.t. 2/3 of their (a)(i)
(iii)	$-q + -\frac{2}{3}p + \frac{2}{3}q$	oe	<b>M1</b>	$-q$ + their (ii) or $-p + -\frac{1}{2}$ their (ii)
	$-\frac{2}{3}p - \frac{1}{3}q$		<b>A1</b>	
(iv)	$p + -\frac{2}{3}p + \frac{2}{3}q$	oe	<b>M1</b>	$p$ + their (ii) or $q + -\frac{1}{2}$ their (ii),
	$\frac{1}{3}p + \frac{2}{3}q$		<b>A1</b>	or $p + q$ + their (iii) Accept in column vector
(b)(i)	(4, -2)		<b>B1</b>	
(ii)	$\begin{pmatrix} -3 \\ 4 \end{pmatrix}$		<b>B1</b>	
(c)(i)	Rotation only, 90° clockwise oe, centre (0, 0)		<b>B1</b> <b>B1</b> <b>B1</b>	e.g. -90° or 270°
(ii)	(3, -5)		<b>B1</b>	
(d)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$		<b>B2</b>	B1 each correct column
				14
7(a)(i)	$\frac{54 + 21 + 8a + 45}{9 + 3 + a + 5} = 7.2$	oe	<b>M1</b>	Accept products shown
	$120 + 8a = 122.4 + 7.2a$	oe	<b>M1</b>	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	cao	<b>A1</b>	www 3
(iii)	20	cao	<b>B1ft</b>	17 + their (a), provided (a) is positive integer
	7	cao	<b>B1</b>	
(b)(i)	14 to 14.2	cao	<b>B1</b>	
(ii)	6	cao	<b>B1</b>	
(iii)	28	cao	<b>B1</b>	
(iv)	22		<b>B1ft</b>	their (iii) – their (ii) dep on both values being less than 50 and (iii) is greater than (ii)
(v)	31.5 to 32		<b>B1</b>	
(vi)	60	cao	<b>B1</b>	
(c)(i)	150		<b>B1</b>	
(ii)	125		<b>B1</b>	
(iii)	Mid values 25, 62.5, 87.5 (‘150’ × 25 + 100 × 62.5 + ‘125’ × 87.5)		<b>M1</b> <b>M1</b>	dep
	( 20937.5 ) ÷ ‘375’		<b>M1</b>	Not for 3 or 4 or 5 used as frequencies dep on 2 <sup>nd</sup> M1
	55.8 (3...)	cao	<b>A1</b>	www4
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8(a)(i)	$2\pi \times 5 \times 9 + 2\pi \times 5^2$ <p style="text-align: center;"><b>439.8 to 440</b></p>	M1 A1	www2
(ii)	$\frac{A - 2\pi r^2}{2\pi r}$ <p style="text-align: center;">o.e. final ans</p>	M1 M1	for correct first step ft for correct second step
(iii)	$\frac{377 - 2\pi \times 6^2}{2\pi \times 6}$ <p style="text-align: center;">or <math>\frac{377}{2\pi \times 6} - 6</math></p> <p style="text-align: center;"><b>3.99 to 4.01</b></p>	M1	correct or ft their (ii) Could restart but must get to explicit stage
(iv)	$2\pi r \times r + 2\pi r^2 = 1200$ $4\pi r^2 = 1200$ <p style="text-align: center;">or better</p> <p style="text-align: center;"><b>9.77 to 9.78</b></p>	A1 M1 A1 A1	may be embedded www3 may be embedded www3
(b)(i)	<b>134</b>	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)	$\left(\frac{x}{45}\right) - 7 = \left(\frac{x-75}{48}\right)$ $48x - 15120 = 45x - 3375$ <p style="text-align: center;">oe</p> <p style="text-align: center;"><b>3915</b>    cao</p>	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)	$x + y(\dots)12$ $x(\dots)4$ <p style="text-align: center;">both inequality signs correct <math>\leq</math> <math>\geq</math></p>	B1 B1 B1	Dep on first B1 and either 2 <sup>nd</sup> 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 <b>only</b> 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)	<b>18</b> cao from (6, 6)	A1 M1	or follow through highest value from minor slip triangle
	<b>27</b> cao	A1	If answers reversed and otherwise correct allow SC2

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