

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper
for the guidance of teachers

0580 MATHEMATICS	
0580/43	Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, 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, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Page 2	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2011	0580

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

Qu.	Answers	Mark	Part Marks	
1 (a)	(i) 34.65	1		
	(ii) 41.58	2	M1 for 0.15×277.2 implied by 41.6 or 41.58 seen and not spoiled	
	(iii) 264	3	M2 for $277.2 \div (1 + 0.05)$ o.e. or M1 for recognition that $105(\%) = 277.20$	
	(b)			
	(i) 1000	2	M1 for $2200 \div (2 + 4 + 5) \times 5$	
	(ii) 3650	2	M1 for $2200 \div 44 \times 73$	
2 (a)	(i) Image at (4, -4), (6, -4), (6, -6), (2, -6)	2	SC1 for reflection in y-axis	
	(ii) Image at (-4, -4), (-4, -6), (-6, -6), (-6, -2)	2 ft	SC1 ft if rotated 90° anti-clockwise about (0, 0)	
	(iii) Reflection $y = -x$	1 ft	ft their Z (name of transformation)	
		1 ft	independent (full details)	
	(b)			
		(i) Image at (2, 2), (3, 2), (3, 3), (1, 3)	2	SC1 for enlargement s.f. 0.5 with correct orientation, different centre or sf - 0.5, centre (0, 0)
	(ii) $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$ cao	2	B1 B1 each column	
(c)	(i) Image at (0, 4), (2, 4), (0, 6), (-4, 6)	2	SC1 if 3 vertices correct	
	(ii) $\begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}$	2	SC1 for $\begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix}$, $k \neq 0$ but can be algebraic or numeric or for $\begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$	

Page 3	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2011	0580

<p>3 (a)</p> <p>(b)</p> <p>(c)</p>	<p>$(x + 5)^2 - 2x^2 = 1$ oe</p> <p>$(x + 5)^2 = x^2 + 10x + 25$ or $x^2 + 5x + 5x + 25$</p> <p>$x^2 + 10x + 25 - 2x^2 = 1$ $0 = x^2 - 10x - 24$</p> <p>12</p> <p>53.1 to 53.2 www 3</p>	<p>M1</p> <p>B1</p> <p>E1</p> <p>3</p> <p>3</p>	<p>Equiv means equation in the three parts, allowing $(x + 5)^2$ expanded</p> <p>For final line reached without any errors or omissions after any previous line with $(x + 5)^2$ expanded</p> <p>M2 for $(x - 12)(x + 2)$ or full correct expression from formula. Allow SC1 for $(x + a)(x + b)$ and $ab = -24$ or $a + b = -10$ then SC1 ft (dependent on quadratic factors or two roots from formula) for correct selection of +ve root, if only one +ve. Answer of 12 and -2 scores M2 only</p> <p>M2 for $2 \times \tan^{-1}(\frac{1}{2})$ o.e. i.e. any complete method or M1 for $\tan = \frac{1}{2}$ o.e. i.e. any correct method leading to any angle in diagram (expressions can be implicit and bod which angle is being worked out) (Implied by 26.56 to 26.57 or 26.6, 63.43 to 63.44 or 63.4, 126.8 to 126.9) 53 or 127 without working score 0</p>
<p>4 (a)</p> <p>(b)</p> <p>(c)</p>	<p>$(\cos(A)) = \frac{6^2 + 8^2 - 9^2}{2 \cdot 6 \cdot 8}$</p> <p>78.58... www 4</p> <p>(i) 78.6</p> <p>(ii) $r = \frac{4.5}{\sin(78.6)}$ oe</p> <p>4.590 to 4.591 cao www 3</p> <p>35.5 (35.48 to 35.57...) cao www 4</p>	<p>M2</p> <p>A2</p> <p>1</p> <p>M2</p> <p>A1</p> <p>4</p>	<p>M1 for correct implicit equation with $\cos A$</p> <p>A1 for 0.1979 to 0.198 (this implies M2)</p> <p>Allow 78.58...</p> <p>(M1 for $\sin(78.6) = \frac{4.5}{r}$)</p> <p>Allow 78.58... or their angle <i>BOM</i> for M2 or M1</p> <p>M1 Area triangle = $0.5 \times 6 \times 8 \times \sin(78.6)$ oe Allow 78.58.. (23.52..) M1 Circle = $\pi \times 4.59^2$ Allow 4.590 to 4.591 (66.15 to 66.22...) M1 (dependent) % = triangle / circle $\times 100$ Dependent on first 2 M's</p>

Page 4	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2011	0580

5 (a)	9.11, 4.25, 2, ..., 2, 4.25, 9.11	3	B2 for 4 or 5 correct and B1 for 2 or 3 correct
(b)	12 points plotted Smooth curve through 12 points Two branches, neither touching y-axis	5	P3, ft their (a), P2 for 10 or 11 points, P1 for 8 or 9. C1 correct shape ft their points shape same. Ignore anything between -0.5 and 0.5 . B1 independent
(c)	(i) $x = 0$ (ii) tangent at -1.5 -3 to -1.8	1 T1 2	Dependent on tangent M1(also dep on T1) for attempt at rise/run or SC1 for 1.8 to 3 B1 for 1 or more correct
	(iii) -1.7 to -1.55 , -0.7 to -0.55 , 0.55 to 0.7 , 1.55 to 1.7 (iv) $y = 2x$ drawn to meet graph twice 1 1.8 to 1.9	2 B1 B1 B1	
6 (a)	(i) 5.8 (ii) 4.6 to 4.65 (iii) 2.35 to 2.5 (iv) 172 or 171	1 1 1 2	SC1 for 28 or 29
(b)	(i) 72 to 76, 38 to 42 (ii) Their correct $\Sigma fx \div 200$	2 4	Must be integers. B1 either. M1 for 3 or 4 correct mid-values seen 2, 5, 6.5, 8.5 M1 for Σfx , ft their frequencies and x anywhere in interval, including boundaries $36 \times 2 + (72 \text{ to } 76) \times 5 + (38 \text{ to } 42) \times 6.5 + 50 \times 8.5$ M1 for $\div 200$ or their 200 (dependent on second M1) (74, 40 give 1127 then 5.635 (or 5.64 or 5.63)) Other pairs of frequencies from (b)(i) must have a sum of 114 to gain the A mark.
	(iii) $p \div 2$, q , where p, q are from (b)(i) Histogram with two new columns of correct width Two correct heights	2ft 2ft	B1 either ft (ft their table) B1 B1 ft (ft their freq. densities)

Page 5	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2011	0580

7 (a)	Correct tree diagram.	5	B1 for labels flower and not flower First pair B1 for $\frac{7}{10}$ and $\frac{3}{10}$ B1 for next three branches after flowers B1 for clear labels for colours B1 for $\frac{2}{3}$, $\frac{1}{4}$ and $\frac{1}{12}$ in correct places If three branches at ends of both branches of first pair, lose final B, unless probabilities of 0 indicated.
(b)	$\frac{33}{40}$ o.e. (0.825) cao	3	M2 for $1 - \frac{7}{10} \times \frac{1}{4}$ (M1 for $\frac{7}{10} \times \frac{1}{4}$ or $\frac{7}{10} \times (1 - \frac{1}{4})$) oe or M2 for $\frac{3}{10} + \frac{7}{10} \times \frac{2}{3} + \frac{7}{10} \times \text{their } \frac{1}{12}$ or $\frac{3}{10} + \frac{7}{10} \times \frac{3}{4}$ oe
(c)	7 cao	2	M1 for $120 \times \frac{7}{10} \times \text{their } \frac{1}{12}$
8 (a)	Arc centre D , radius 6 cm	1	
(b) (i)	Perp bisector of AB , with two pairs of arcs	2	At least 3 cm from AB . SC1 accurate without arcs or accurate arcs (but no choice)
(b) (ii)	Bisector of angle B , with arcs	2	At least 5 cm from B . SC1 accurate without arcs or accurate arcs (but no choice)
(c) (i)	Q at intersection of loci	1	Dependent on at least both SC1's
(c) (ii)	2.7 cm to 2.9 cm cao	1	Dependent on (c)(i)
(d)	Region inside arc, to left of perp bisector and below angle bisector	1	Dependent on at least both SC1's in (b)
9 (a) (i)	81	2	B1 for $(f(2) =) 7$
(a) (ii)	8.5	2	B1 for $(f(0.5) =) 2.5$
(b)	$\frac{x-1}{3}$ oe	2	M1 for $(x =) \frac{y-1}{3}$ or $(x =) \frac{f(x)-1}{3}$ or $3y = x - 1$ or $3f(x) = x - 1$ or -1 then $\div 3$ in flowchart (must be clear)
(c)	$3x^2 + 12x + 13$ final answer	2	M1 for $3(x+2)^2 + 1$ or better
(d)	$(x =) \frac{-3 \pm \sqrt{3^2 - 4(1)(1)}}{2(1)}$	2	B1 for $\sqrt{3^2 - 4(1)(1)}$ or better Seen anywhere If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ oe, B1 for $p = -3$ and $r = 2(1)$ or $(x + \frac{3}{2})^2$ B1 then $\sqrt{\frac{9}{4} - 1}$ B1
	-2.62, -0.38 final answer	1,1	If 0, SC1 for -2.6 or -2.62 or -2.618... and -0.4(0) or -0.38 or -0.382 to -0.381 seen Answers only B1 B1

Page 6	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2011	0580

10 (a)	(i) (a) $\mathbf{p} + \mathbf{q}$	1		
	(b) $\frac{1}{2}\mathbf{p} - \frac{1}{2}\mathbf{q}$ oe	2	M1 for $\overrightarrow{LC} + \overrightarrow{CM}$ o.e. can be written in terms of \mathbf{p} and/or \mathbf{q}	
	(c) $\frac{3}{4}\mathbf{p} + \frac{3}{4}\mathbf{q}$ oe cao	2	M1 for $\overrightarrow{AD} + \overrightarrow{DL} + \overrightarrow{LN}$ o.e can be written in terms of \mathbf{p} and/or \mathbf{q} ft their (i)(b)	
	(ii) \overrightarrow{AN} is a multiple of \overrightarrow{AC} o.e	1	Must be vectors (dependent on answers to (a), (c))	
(b)	(i) 30	2	M1 for $2x + x + 15 + 75 = 180$ or better	
	(ii) 135	1ft	ft 165 – their x but only if final answer obtuse	
11 (a)	(i) 10	1		
	(ii) $\frac{3 \times 4}{2}$ or $\frac{3 \times (3+1)}{2}$ (= 6)	1		
	(iii) 7260	1		
	(iv) 12 840	2	M1 for $S_{200} - S_{120}$ (20100 – 7260) or $\frac{80}{2}(121 + 200)$ o.e.	
	(v) 160 400	2	M1 for $2(1 + 2 + 3 + \dots + 400)$ o.e.	
	(b)	(i) 36, 100	1, 1	Ignore right-hand column
		(ii) 11025	1	
		(iii) $\left[\frac{n(n+1)}{2}\right]^2$ oe	1	isw
		(iv) 3 348 900	1	M1 for square root then $\times 2$ (1056)
		(v) 32	2	or SC1 for answer 33