GCE

Mathematics

Advanced Subsidiary GCE

Unit **4722:** Core Mathematics 2

Mark Scheme for June 2011

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1 (i)	$BC^2 = 9^2 + 17^2 - 2 \times 9 \times 17 \times \cos 40^\circ$ $BC = 11.6$ cm	**M1**		Attempt use of correct cosine rule	Must be correct formula seen or implied, but allow a slip when evaluating eg omission of 2, or incorrect use of an additional big bracket. Allow M1 even if subsequently evaluated in radian mode (23.96). Allow M1 if expression is not square rooted, as long as it is clear that correct formula was used ie either $BC^2 = \ldots$ or even just $a^2 = \ldots$ if the power disappears from BC.
		A1	**2**	Obtain 11.6, or better	Actual answer is 11.644329… so allow more accurate answer as long as it rounds to 11.64
(ii)	area $= \frac{1}{2} \times 9 \times 17 \times \sin 40$ $= 49.2$ cm^2	**M1**		Attempt triangle area using (½)$ab\sin C$, or equiv	Condone omission of ½ from this formula, but no other errors allowed. If using right-angled triangle, must use ½bh with reasonable attempt at perpendicular sides. Allow M1 if subsequently evaluated in radian mode (57.00). If using 40°, must be using sides of 9 and 17, not 11.6 from (i). If using another angle, can still get M1 as long as sides used are consistent with this angle.
		A1	**2**	Obtain 49.2, or better	Actual answer is 49.17325… so allow more accurate answer as long as it rounds to 49.17 Must come from correct working only.
(iii)	$\frac{BD}{\sin 40} = \frac{9}{\sin 63}$ $BD = 6.49$ cm	**M1**		Attempt use of correct sine rule, or equiv, to find length BD	No further rearrangement required. Could have both fractions the other way up. Must be angles of 40° and 63° if finding BD directly. Must be attempting BD, so using 77° to find AD is M0 unless attempt is then made to find BD by any valid method. Placing D on BC is M0.
		A1		Obtain correct unsimplified expression involving BD as the only unknown	Can still get A1 even if evaluated in radians (40.07). If using a multi-step method (eg use 77^0 to find AD and then use cosine rule to find BD) then this A mark is only given when a correct (unsimplified) expression involving BD as the only unknown is obtained.
		A1	**3** $\boxed{7}$	Obtain 6.49, or better	Actual answer is 6.492756… so allow more accurate answer as long as it rounds to 6.493 Must come from correct working only not eg sin 117.

2 (i)	$\int\left(6x^{\frac{1}{2}}-1\right)\mathrm{d}x = 4x^{\frac{3}{2}} - x + c$	**M1**		Obtain $kx^{\frac{3}{2}}$	Any k, as long as numerical. Allow both M1 and A1 for equiv eg $x\sqrt{x}$
		A1		Obtain $4x^{\frac{3}{2}}$	Allow for unsimplified coefficient as well (ie $^{6}/_{1.5}$).
		B1	**3**	Obtain $-x$ (don't penalise lack of + c)	Allow -1x. Maximum of 2 marks if $\int$ or dx still present in final answer. Maximum of 2 marks if not given as one expression – eg the two terms are integrated separately and never combined.
(ii)	$y = 4x^{\frac{3}{2}} - x + c$ $17 = 32 - 4 + c \Rightarrow c = -11$ hence $y = 4x^{\frac{3}{2}} - x - 11$	**M1***		State or imply y = their integral from (i)	Must have come from integration attempt ie increase in power by 1 for at least one term, but allow if -1 disappeared in part (i) ie at least one of the M1 and the B1 must have been awarded in part (i). Can still get this M1 if no + c. The y does not have to be explicit – it could be implied by eg 17 = F(4). M0 if they start with y = their integral from (i), but then attempt to use $y - 17 = m(x - 4)$. This is a re-start and gains no credit.
		M1d*		Attempt to find c using (4, 17)	M0 if no + c. M0 if using $x = 17$, $y = 4$.
		A1	**3**	Obtain $y = 4x^{\frac{3}{2}} - x - 11$	Coefficients now need to be simplified, so -1x is A0. Allow A1 for equiv eg $x\sqrt{x}$ Must be an equation ie y = …, so A0 for 'equation = …' or 'f(x) = …'
			$\boxed{6}$		

3 (i)	perimeter = $2r + r\theta$ $16 + 8\theta = 23.2$ $8\theta = 7.2$ $\theta = 0.9$ rads	**B1***		State or imply that arc length 8θ, or equiv in degrees ie $^{\theta}/_{360} \times 16\pi$	Allow B1 by implication for $^{23.2}/_{8}$ or equivalent in degrees.
		M1d*		Equate attempt at perimeter to 23.2 and attempt to solve for θ	Need to get as far as attempting θ. Must include 2 radii and correct expression for arc length, either in radians or degrees. M0 if using chord length.
		A1	**3**	Obtain $\theta = 0.9$ rads	Obtaining 0.9 and then giving final answer as 0.9π is A0 – do not isw as this shows lack of understanding. Finding θ in degrees (51.6^{o}) and then converting to radians can get A1 as long as final answer is 0.9 (and not eg 0.9006 from premature approximation).
(ii)	$½ \times 8^2 \times 0.9 = 28.8$	**M1**		Attempt area of sector using $(½)\ r^2\theta$	Condone omission of ½, but no other error. Allow if incorrect angle from part (i), as long as clearly intended to be in radians. Allow equivalent method using fractions of the area. Allow working in degrees as long as it is a valid method. Allow M1 if using 0.9π (even if 0.9 was answer to (i)), as long as clearly attempting $(½)\ r^2\theta$ with error on angle rather then $(½)\ \pi r^2\theta$.
		A1	**2**	Obtain 28.8	Or any exact equiv. If 0.9 obtained incorrectly in part (i), full credit can still be gained in part (ii). Condone minor inaccuracies from working in degrees, as long as final answer is given as 28.8 exactly.
			$\boxed{5}$		

4 (i)	$x + 4 = (y + 1)^2$ $x + 4 = y^2 + 2y + 1$ $x = y^2 + 2y - 3$ **A.G.**	**M1**		Attempt to make x the subject	Allow M1 for $x = (y \pm 1)^2 \pm 4$ only. Allow M1 if $(y + 1)^2$ becomes $y^2 + 1$, but only if clearly attempting to square the entire bracket – squaring term by term is M0. Must be from correct algebra, so M0 if eg $\sqrt{(x + 4)} = \sqrt{x} + \sqrt{4}$ is used.
		A1	**2**	Verify $x = y^2 + 2y - 3$	Need to see an extra step from $(y + 1)^2 - 4$ to given answer ie explicit expansion of bracket. No errors seen. **SR B1** for verification, using $y = -1 + \sqrt{(y^2 + 2y - 3 + 4)}$, and confirming relationship convincingly, or for rearranging $x = f(y)$ to obtain given $y = f(x)$.
(ii)	$\int_1^3 (y^2 + 2y - 3)\,dy = \left[\frac{1}{3}y^3 + y^2 - 3y\right]_1^3$ $= (9 + 9 - 9) - (\frac{1}{3} + 1 - 3)$ $= (9) - (-1\frac{2}{3})$ $= 10\frac{2}{3}$	**B1**		State or imply that the required area is given by $\int_1^3 (y^2 + 2y - 3)\,dy$	No further work required beyond stating this. Allow if $3x$ appears in integral. Any further consideration of other areas is B0.
		M1		Attempt integration	Increase in power of y by 1 for at least two of the three terms. Can still get M1 if the -3 disappears, or becomes $3x$. Allow M1 for integrating a function of y that is no longer the given one, eg subtracted from 3, or using their incorrect rearrangement from part (i).
		A1ft		Obtain at least two correct terms	Allow for unsimplified coefficients. Allow follow-through on any function of y as long as at least 2 terms and related to the area required. Condone $\int$, dy or + c present.
		M1		Attempt F(3) – F(1) for their integral	Must be correct order and subtraction. This is independent of first M1 so can be given for substituting into any expression other than $y^2 + 2y - 3$, including $2y + 2$. If last term is $3x$ allow M1 for using 3 and 1 throughout integral, but M0 if x value is used instead.
		A1	**5** $\boxed{7}$	Obtain $10\frac{2}{3}$ aef	Must be an exact equiv so $10.\dot{6}$ is fine (but $9^5/_3$ is A0). 10.7, 10.66… or $10^2/_3 + c$ are A0. Must come from correct integral, so A0 if from $3x$. Must be given as final answer, so further work eg subtracting another area is A0 rather than ISW. Answer only is 0/5, as no evidence is provided of integration. **SR** Finding the shaded area by direct integration with respect to x (ie a C3 technique) can have **5** if done correctly, **4** if non-exact decimal given as final answer but no other partial credit.

5	Throughout this question, candidates may do valid work in the incorrect answer space. This can be marked and given credit wherever it occurs, as long as it does not contradict the working and final answer given in the designated space.				
(i)	243	**B1**	**1**	State 243, or 3^5	B0 if other terms still present eg ${}^5C_0$ or 3^0. Could be part of a longer expansion, in which case ignore all other terms unless also solely numerical.
(ii)	2nd term = 5 x 3^4 x (kx) = $405kx$ 3rd term = 10 x 3^3 x $(kx)^2$ = $270k^2x^2$ $405k = 270k^2 \Rightarrow k = 1.5$	**B1**		Obtain $405k$ as coeff of x	Either stated, or written as $405kx$. Allow unsimplified expression ie 5 x 3^4 x k or 5 x 3^4 x (kx), even if subsequently incorrectly evaluated. B0 if still ${}^5C_1$ unless later clearly used as 5.
		M1		Attempt coeff of x^2	Needs to be an attempt at a product involving the relevant binomial coefficient (not just ${}^5C_2$ unless later seen as 10), 3^3 and an intention to square the final term (but allow for kx^2). $67.5k^2$ is M0 (from $^5/_2$ x 3^3).
		A1		Obtain $270k^2$	Allow unsimplified ie 10 x 3^3 x k^2 or 10 x 3^3 x $(kx)^2$ even if subsequently incorrectly evaluated. Allow $270k^2$ following 10 x 3^3 x kx^2 ie an invisible bracket was used.
		M1		Equate coefficients and attempt to solve for k	Must be one linear and one quadratic term in k, and must be appropriate method to solve this two term quadratic eg factorise or cancel common factor of k. Condone powers of x still present when equated, as long as not actually used in solution method. Could still gain M1 if incorrect, or no, binomial coefficients used – each term must be product of powers of 3 (poss incorrect), correct powers of k and any binomial coefficient used.
		A1	**5**	Obtain $k = 1.5$ (ignore any mention of $k = 0$)	Any exact equivalent, including unsimplified fraction. Could be implied by writing $(3 + 1.5x)^5$. **NB** If expansion is given as $405kx + 270kx^2$, and candidate then concludes that $k = {}^{405}/_{270}$ this is B1 M1 only as k^2 never seen.

(iii)	$10 \times 3^2 \times 1.5^3 = 303.75$	M1		Attempt $10 \times 3^2 \times k^3$	Need to see 10 so just ${}^5C_3$ is not good enough for M1. Need to see correct powers intended, even if incorrectly evaluated. This includes a clear intention to cube 1.5 (or their k), so $10 \times 9 \times 1.5x^3 = 135x^3$ is M0. Can get M1 if using their incorrect k, including 0, but M0 if the value of k used is different to that obtained in (ii). For incorrect numerical answer (following incorrect k), we need to see evidence of method – it cannot be implied by answer only. If k = -1, 0 or 1 we still need to see evidence of cubing. If $90k^3$ is seen in part (ii) (or even (i)) then this is sufficient for M1 unless contradicted by their work in part (iii). Allow if still k rather than numerical.
		A1	2	Obtain 303.75 (allow $303.75x^3$)	Or any exact equivalent. Ignore if subsequently rounded eg to 304 as long as exact value seen.
			$\boxed{8}$		If 1.5 obtained incorrectly in part (ii), full credit can still be gained in part (iii).

6(i)	f(1) = 1 f(–1) = 21 f(2) = 0, hence $(x – 2)$ is a factor	**M1**		Attempt use of factor theorem at least once	Just substituting at least one value for x is enough for M1, showing either the working or the result, or both. Just stating f(a) = k is enough – don't need to see term by term evaluation. If result is inconsistent with the f(a) being attempted, then we do need to see evidence of method used. No conclusion required. M0 A0 for division attempts, even if considering remainder.
		A1	**2**	Obtain factor of $(x – 2)$	Allow A1 for sight of $(x – 2)$, even if $x = 2$ also present. No words required, but penalise if used incorrectly ie A0 if explicitly labelled as 'root'. A0 if $(x – 2)$ not seen in this part, even if subsequently used in (ii). **SR B1** for $(x – 2)$ stated with no justification, and no incorrect terminology.
(ii)	$f(x) = (x – 2)(x^2 + 3x – 5)$ $x = \frac{-3 \pm \sqrt{29}}{2}$ or $x = 2$	**M1**		Attempt complete division by a linear factor, or equivalent ie inspection or coefficient matching	Need linear factor of form $(x \pm a)$, $a \neq 0$. Allow if factor different to their answer to (i), inc no answer to (i). Must be complete attempt at all three terms. If long division then need to be subtracting lower line; if coefficient matching then need to be considering all possible terms from their expansion to equate to relevant coefficient from cubic; if inspection then expansion must give at least one correct coefficient for the two middle terms in the cubic.
		A1		Obtain $x^2 + 3x + c$ or $x^2 + bx – 5$	Obtain x^2 and one other correct term. Just having two correct terms does not imply M1 – need to look at method used for third term. If coefficient matching allow for stating values eg $a = 1$ etc. If quadratic factor given with minimal working in (ii), there may be more evidence of method shown in (i).
		A1		Obtain $x^2 + 3x – 5$	Could appear as quotient in long division, or as part of product if inspection. If coefficient matching, must now be explicitly stated rather than just $a = 1$, $b = 3$, $c = -5$.
		M1		Attempt to solve quadratic equation	Using quadratic formula or completing the square – see extra guidance sheet. Quadratic must come from division attempt, even if this was not good enough for first M1.
		A1		Obtain $\frac{1}{2}(-3 \pm \sqrt{29})$	Or $^{-3}/_2 \pm \sqrt{^{29}/_4}$ from completing the square. Ignore terminology and ignore if subsequently given as factors, as long as seen fully simplified as roots.
		B1	**6**	State 2 as root, at any point	Must be stated in this part, not just in part (i). Ignore terminology.
			$\boxed{8}$		

7(a) (i)	$u_9 = 7 \text{ x } (-2)^8$ $= 1792$	**M1**		Attempt u_9 using ar^8	Allow for 7 x -2^8. Using $r = 2$ will be marked as a misread.
		A1	**2**	Obtain 1792	Condone brackets not being shown explicitly in working. **SR B2** for listing terms, as long as signs change. Need to stop at u_9 or draw attention to it in a longer list.
(ii)	$S_{15} = \dfrac{7\left(1-(-2)^{15}\right)}{1-(-2)}$ $= 76{,}461$	**M1**		Attempt sum of GP using correct formula	Must be using correct formula, so denominator of 1–2 is M0 unless $1 - r$ clearly seen previously. If $n = 14$ used, then only mark as misread if no contradictory evidence seen – starting with $S_{15} = \ldots$ implies error in using in formula so M0.
		A1	**2**	Obtain 76,461	Condone brackets not being shown explicitly in working. **SR B2** for listing terms and then manually adding them.
(b)	$^N/_2\,(2 \text{ x } 7 + (N-1) \text{ x } -2) = -2900$ $N(16 - 2N) = -5800$ $N^2 - 8N - 2900 = 0$ $(N-58)(N+50) = 0$ $N = 58$	**B1**		State correct unsimplified S_N	If $(n-1)d$ is written as $(N-1) - 2$, then give benefit of doubt and allow B1, even if misused in subsequent work (eg becomes $N - 3$), unless there is clearly an error in the formula used.
		M1		Equate attempt at S_N to –2900 and rearrange to $f(N) = 0$	Must be attempt at S_N for an AP, so using u_N or GP formulae will be M0. M0 if $(N-1) - 2$ becomes $N - 3$. To give M1 at least one of the two terms in the bracket must have been multiplied by -2. Can still get M1 if incorrect formula as long as recognisable, and is quadratic in N. Expand brackets and collect all terms on one side of equation. Allow slips eg not dividing all terms in bracket by 2.
		A1		Obtain $N^2 - 8N - 2900 = 0$	Any equivalent form as long as $f(N) = 0$ (but condone 0 not being explicit).
		M1		Attempt to solve 3 term quadratic	Any valid method – as long as it has come from equating an attempt at S_N of an AP to -2900..
		A1	**5**	Obtain 58 only	58 must clearly be intended as only final answer – could be through underlining, circling or deleting other value for N. No need to see other value for N – if seen, allow slips as long as factorisation / substitution into formula is correct.
			$\boxed{9}$		58 from answer only or trial and improvement can get 5/5. 58 and -50 with no working is 4/5.

8(i)	translation of 3 units in negative y-direction	**B1**		State translation	Not shift, move etc.
		B1	**2**	State or imply 3 units in negative y-direction	Independent of first B1. Statement needs to clearly intend a vertical downwards move of 3, without ambiguity or contradiction, such as '3 down', '-3 in the y direction' etc or vector notation. B0 if direction unclear, such as 'in the y-axis' (could be along or towards) or 'along the y-axis' (unless direction made clear). Allow '3' or '3 units' but not '3 places', '3 spaces', '3 squares', '3 coordinates' or mention of (scale) factor of 3. If both a valid statement and an ambiguous statement are made eg '3 units down on the y-axis' then still award B1. Ignore irrelevant statements, such as where the y-intercept is, whether correct or incorrect. Give BOD on double negatives eg 'down the y-axis by – 3 units' unless clearly wrong or contradictory eg 'negative y-direction by $\begin{pmatrix}-3\\0\end{pmatrix}$'.
(ii)	$y = -2$	**B1**	**1**	State or imply $y = -2$	Just stating -2 is enough. B0 for final answer of $2^0 - 3$ or $1 - 3$. (-2, 0) is B0 unless -2 already seen or implied as y-coordinate.
(iii)	$2^x = 3$ $x = \log_2 3$	**M1**		Attempt to solve $2^x - 3 = 0$	Rearrange to $2^x = 3$, introduce logarithms (could be no base or any base as long as consistent) and then attempt expression for x. M0 for $x = \log_3 2$. M1 A0 for alternative, correct, log expressions such as ${}^{\log 3}/_{\log 2}$ or $1/\log_3 2$. Decimal equivalent of 1.58 can get M1 A0. $x = \log_2 (y + 3)$ is M0 (unless y then becomes 0).
		A1	**2**	State $\log_2 3$	Doesn't need to be $x = \ldots$ Change of base is not on the specification, but is a valid method and can gain both marks. Allow if base not initially specified, but then both logs become base 2. **NB** $x - \log_2 3 = 0$ leading to correct answer, can get full marks as there is no incorrect statement seen.

(iv)	$2^p = 65$ $\log 2^p = \log 65$ $p\log 2 = \log 65$ $p = 6.02$	M1*		Rearrange equation and introduce logs (or $\log_2$)	Must first rearrange to $2^p = k$, with k from attempt at 62 ± 3, before introducing logs. Can use logs to any base, as long as consistent, or equiv with $\log_2$.
		M1d*		Drop power and attempt to solve	Dependent on first M1. $p = \log_2 k$ will gain both M marks in one step. If taking logs to any other base, or no base, or $\log_2$ on both sides then need to drop power of p and attempt to solve using a sound algebraic method ie $p = {}^{\log k}/_{\log 2}$.
		A1	3	Obtain 6.02, or better	Decimal answer reqd, if more than 3sf it must be in range [6.022, 6.023]. Answer only, or trial and improvement, is 0/3 as no evidence of using logs as requested.
(v)	$0.5\times0.5\times\{2^3-3+2(2^{3.5}-3)+2^4-3\}$ $= 8.66$	M1		Attempt y-values at $x =$ 3, 3.5, 4	M0 if other y-values also found (unless not used in trap rule). Allow M1 for using incorrect function as long as still clearly y-values that are intended to be the original function eg $2x - 3$ or $2^{(x-3)}$.
		M1		Attempt correct trapezium rule	Must be correct structure ie 0.5 x 0.5 x ($y_0 + 2y_1 + y_2$). Must be finding area from 3 to 4, so using eg x = 0, 0.5, 1 is M0. Allow if still in terms of y_0 etc as long as these have been clearly defined elsewhere. Using x-values in trapezium rule is M0, even if labelled y-values. Allow a different number of strips (except 1) as long as their h is consistent with this, and the limits are still 3 and 4.
		A1	3	Obtain 8.66, or better	If final answer given to more than 3sf, allow answers in range [8.655, 8.657]. Exact answer from integrating $e^{x\ln 2} - 3$ is 0/3. Answer only is 0/3. Attempting integration before using trapezium rule is 0/3. Using two separate trapezia is fine.
			$\boxed{11}$		

9(a) (i)	π radians	**B1**	**1**	State π	Allow 3.14 radians or 180^0. B0 for $0 \le x \le \pi$.
(ii)	$(^{\pi}/_{2}, -1)$	**B1**		State $x = {}^{\pi}/_{2}$	Allow 1.57 radians, or better. Allow $A = {}^{\pi}/_{2}$. B0 for 90^0.
		B1	**2**	State $y = -1$	Allow $\cos 2A = -1$. **SR** Award **B1** for $(-1, {}^{\pi}/_{2})$
(iii)	$\cos 2x = 0.5$ $2x = {}^{\pi}/_{3}, {}^{5\pi}/_{3}$ $x = {}^{\pi}/_{6}, {}^{5\pi}/_{6}$ hence ${}^{\pi}/_{6} \le x \le {}^{5\pi}/_{6}$	**M1**		Attempt correct solution method	Inverse cos and then divide by 2, to find at least one angle.
		A1		Obtain ${}^{\pi}/_{6}$ (allow 0.524 or 30^o)	Just mark angle, ignore any (in)equality signs.
		A1		Obtain ${}^{5\pi}/_{6}$ (allow 2.62 or 150^o)	Needs to be single term so $\pi - {}^{\pi}/_{6}$ is A0. Just mark angle, ignore any (in)equality signs. A0 if any other angles in range $0 \le x \le \pi$.
		A1	**4**	Obtain ${}^{\pi}/_{6} \le x \le {}^{5\pi}/_{6}$ (exact radians only)	Allow two separate inequalities as long as both correct and linked by **'and'** (not 'or', a comma or no link). Mark final answer and condone incorrect inequality signs elsewhere in solution. **SR** If alternative methods (eg double angle formulae) or inspection are used (or no method shown at all) then mark as **B2** Obtain one correct angle (degrees or radians) **A1** Obtain second correct angle – and no others **A1** Obtain correct inequality (exact radians only)

(b)	$\tan 2x = {}^{1}/_{\sqrt{3}}$ $2x = {}^{\pi}/_{6}, {}^{7\pi}/_{6}$ $x = {}^{\pi}/_{12}, {}^{7\pi}/_{12}$	**B1**		Obtain $\tan 2x = {}^{1}/_{\sqrt{3}}$	Allow for decimal equiv ie $\tan 2x = 0.577$ Allow for $\sqrt{3}\tan 2x = 1$.
		M1		Attempt correct solution method of $\tan 2x = k$	Inverse tan and then divide by 2, to find at least one angle. Could follow error eg $\tan 2x = \sqrt{3}$, even if $\tan 2x = {}^{\cos 2x}/_{\sin 2x}$ clearly used.
		A1		Obtain one correct angle	Could be exact (${}^{\pi}/_{12}$ or ${}^{7\pi}/_{12}$), decimals (0.262 or 1.83) or degrees (15^{o} or 105^{o}). Must come from correct working only.
		A1	**4**	Obtain both correct angles	Must now both be in exact radians. A0 if any other angles in range $0 \le x \le \pi$.
			$\boxed{11}$		
	OR $\cos^2 2x = 3\sin^2 2x$ $4\sin^2 2x = 1$ $4\cos^2 2x = 3$ $\sin 2x = \pm {}^{1}/_{2}$ $\cos 2x = \pm {}^{\sqrt{3}}/_{2}$ $2x = {}^{\pi}/_{6}, {}^{5\pi}/_{6}, {}^{7\pi}/_{6}, {}^{11\pi}/_{6}$ $x = {}^{\pi}/_{12}, {}^{5\pi}/_{12}, {}^{7\pi}/_{12}, {}^{11\pi}/_{12}$ $x = {}^{\pi}/_{12}, {}^{7\pi}/_{12}$	**B1**		Obtain correct equation in either $\sin^2 2x$ or $\cos^2 2x$	Square both sides and use $\sin^2 2x + \cos^2 2x = 1$ to obtain $4\sin^2 2x = 1$ or $4\cos^2 2x = 3$, or any equiv, including unsimplified eg $1 - \sin^2 2x = 3\sin^2 2x$.
		M1		Attempt correct solution of $\sin 2x = k$ or $\cos 2x = k$	Inverse sin or cos and then divide by 2, to find at least one angle.
		A1		Obtain one correct angle	Could be exact (${}^{\pi}/_{12}$ or ${}^{7\pi}/_{12}$), decimals (0.262 or 1.83) or degrees (15^{o} or 105^{o}). Must come from correct working only.
		A1		Obtain both correct angles	Must now both be in exact radians. A0 if any other angles in range $0 \le x \le \pi$. **SR** If using alternative methods, such as more advanced trig identities, or no method at all shown, then mark as **B3** Obtain one correct angle, (degrees or radians)with no errors seen **B1** Obtain second correct angle, now both in radians

Guidance for marking C2

Accuracy
Allow answers to 3sf or better, unless an integer is specified or clearly required.
Answers to 2 sf are penalised, unless stated otherwise in the mark scheme.
3sf is sometimes explicitly specified in a question - this is telling candidates that a decimal is required rather than an exact answer eg in logs, and more than 3sf should not be penalised unless stated in mark scheme.
If more than 3sf is given, allow the marks for an answer that falls within the guidance given in the mark scheme, with no obvious errors.

Extra solutions
Candidates will usually be penalised if an extra, incorrect, solution is given. However, in trigonometry questions only look at solutions in the given range and ignore any others, correct or incorrect.

Solving equations
With simultaneous equations, the method mark is given for eliminating one variable allowing sign errors, addition / subtraction confusion or incorrect order of operations. Any valid method is allowed ie balancing or substitution for two linear equations, substitution only if at least one is non-linear.

Solving quadratic equations
Factorising – candidates must get as far as factorising into two brackets which, on expansion, would give the correct coefficient of x^2 and at least one of the other two coefficients. This method is only credited if it is possible to factorise the quadratic – if the roots are surds then candidates are expected to use either the quadratic formula or complete the square.
Completing the square – candidates must get as far as $(x + p) = \pm \sqrt{q}$, with reasonable attempts at p and q.
Using the formula – candidates need to substitute values into the formula and do at least one further step. Sign slips are allowed on b and $4ac$, but all other aspects of the formula must be seen correct, either algebraic or numerical. If the algebraic formula is quoted then candidates are allowed to make one slip when substituting their values. Condone not dividing by $2a$ as long as it has been seen earlier.

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