Question Number	Scheme	Marks
9a	$3\cos\theta(\tan\theta\sin\theta+3)=11-5\cos\theta$ $3\sin^2\theta+9\cos\theta=11-5\cos\theta$ or $3\cos\theta\left(\frac{\sin\theta}{\cos\theta}\sin\theta+3\right)=11-5\cos\theta$ $3(1-\cos^2\theta)+9\cos\theta=11-5\cos\theta$ $3\cos^2\theta-14\cos\theta+8=0$ *	M1 dM1 A1*
		(3)
b	$\cos 2x=\frac{2}{3}$ $x=\frac{\cos^{-1}\left(\frac{2}{3}\right)}{2}=...$ $x=$ awrt 24.1, awrt 155.9, awrt 204.1, awrt 335.9	B1 M1 A1A1
		(4)
		(7 marks)

(a)

M1 Substitutes or uses $\tan\theta=\frac{\sin\theta}{\cos\theta}$ to achieve an equation in sine and cosine only.
May be in another variable and condone if there is a mix of variables in the same equation for this mark.

dM1 Attempts to use $\pm\sin^2\theta\pm\cos^2\theta=\pm1$ to achieve an equation in cosine only. It is dependent on the previous method mark. Condone slips in their manipulation of the equation.
May be in another variable and condone if there is a mix of variables in the same equation for this mark.

A1* Achieves $3\cos^2\theta-14\cos\theta+8=0$ with no errors seen including brackets. Withhold this mark for poor notation used such as $3\cos\theta^2-14\cos\theta+8=0$
Allow a candidate to work consistently in one variable and then change to θ but withhold this final mark if there is a mixture of variables within the same equation/line of working.

(b) **Note that answers only scores 0 marks. May work in any variable and do not be concerned as to whether they are writing e.g. *x* or 2*x* in their working**

B1 $(\cos...=)\ \frac{2}{3}$ (ignore any reference to 4)

M1 Solves using the correct order of operations to find at least one value for *x*. You may need to check this on your calculator. May be implied by a correct value for $\cos 2x="\frac{2}{3}"$

A1 Two of awrt 24, awrt 156, awrt 204, awrt 336 . (Condone in radians two of awrt 0.42, awrt 2.7, awrt 3.6, awrt 5.9)

A1 awrt 24.1, awrt 155.9, awrt 204.1, awrt 335.9 and no others in the range
Minimum acceptable to be able to score full marks:
e.g. $\cos...=\frac{2}{3}\Rightarrow$ *answers* or $(...=)\ \cos^{-1}\left(\frac{2}{3}\right)\Rightarrow$ *answers*

Question Number	Scheme	Marks
10a	$\dfrac{(x-k)^2}{\sqrt{x}} = \dfrac{x^2-2kx+k^2}{x^{\frac{1}{2}}} = \dfrac{x^2}{x^{\frac{1}{2}}} - \dfrac{2kx}{x^{\frac{1}{2}}} + \dfrac{k^2}{x^{\frac{1}{2}}} = x^{\frac{3}{2}} - 2kx^{\frac{1}{2}} + k^2x^{-\frac{1}{2}}$	M1
	$\int_1^{16} x^{\frac{3}{2}} - 2kx^{\frac{1}{2}} + k^2x^{-\frac{1}{2}}\,\mathrm{d}x = \left[\dfrac{2}{5}x^{\frac{5}{2}} - \dfrac{4}{3}kx^{\frac{3}{2}} + 2k^2x^{\frac{1}{2}}\right]_1^{16}$	M1A1
	$\dfrac{2}{5}(16)^{\frac{5}{2}} - \dfrac{4}{3}k(16)^{\frac{3}{2}} + 2k^2(16)^{\frac{1}{2}} - \dfrac{2}{5} + \dfrac{4}{3}k - 2k^2 = 6k^2 - 84k + \dfrac{2046}{5}$	dM1A1
		(5)
b	$9 = \dfrac{(1-k)^2}{\sqrt{1}} \Rightarrow 9 = (1-k)^2$	M1
	$k = 4$ only *	A1*
		(2)
c	$q = 36$	B1
	$\dfrac{1}{2}(9+"36")\times 15 - \left("6"(4)^2 - "84"(4) + \dfrac{2046}{5}\right) = \dfrac{1683}{10}$	M1A1
		(3)
		(10 marks)

(a)

M1 Attempts to multiply out the numerator and split the fraction into separate terms. Score for one term with a correct index (which must be processed). Any attempts via substitution e.g. setting $u = \sqrt{x}$ send to review. Condone poor attempts at multiplying out the brackets such that $(x-k)^2 \Rightarrow x^2 \pm k^2$

M1 Attempts to raise the power (which must be a fraction or decimal) by one on one of their terms. (The index does not need to be processed).

A1 $\dfrac{2}{5}x^{\frac{5}{2}} - \dfrac{4}{3}kx^{\frac{3}{2}} + 2k^2x^{\frac{1}{2}}$ or unsimplified equivalent. Indices must be processed. Ignore any spurious notation around the expression. May be with or without $+c$

dM1 Substitutes in 16 and 1 for *x* and subtracts either way round. The values embedded are sufficient and condone invisible brackets. It is dependent on the previous method mark.

A1 $6k^2 - 84k + \dfrac{2046}{5}$ o.e. e.g. $6k^2 - 84k + 409.2$ isw after a correct answer is seen, but withhold this mark if there is spurious notation such as $\int$ or $\mathrm{d}x$ at either the start or end of the answer.

(b)

M1 Substitutes the coordinates of *A* into the equation for *C* or, alternatively, substitutes in the coordinates of *A* and $k = 4$ into the equation for *C*.

A1* Solves either:

- $9 = (1-k)^2 \Rightarrow k = ...$
- $k^2 - 2k - 8 = 0$ with terms collected to a 3TQ via any allowable method including via a calculator.