Question Number	Scheme	Marks
7 (i)	$(2\theta=)\arctan\left(\frac{5}{7}\right)$	M1A1
	$(\theta=)$ awrt $17.8°, 107.8°$	dM1A1 **(4)**
(ii)	$24\tan x = 5\cos x \Rightarrow 24\sin x = 5\cos^2 x$ oe	M1
	$\Rightarrow 24\sin x = 5(1-\sin^2 x)$	dM1
	$\Rightarrow 5\sin^2 x + 24\sin x - 5 = 0$	A1
	$\Rightarrow \sin x = \frac{1}{5}$	ddM1
	$\Rightarrow (x=)$ awrt $0.201, 2.940$	A1 **(5)**
		(9 marks)

In either part condone poor notation, mixed variables or omission of variables in their working provided the intention is clear or implied by further work.

There may be other methods e.g. using double angle formulae. Send to review if you think it may be credit-worthy.

(i) Note that answers only with no working seen scores 0 marks

M1: Attempts to use the relationship $\tan 2\theta = \dfrac{\sin 2\theta}{\cos 2\theta}$ to solve the equation.

Score for e.g. $7\sin 2\theta = 5\cos 2\theta \Rightarrow \tan 2\theta = \dfrac{5}{7}$ oe Condone $\tan 2\theta = \dfrac{7}{5}$ oe

(May use another variable e.g. $x = 2\theta$ provided the intention is clear)

A1: $(2\theta=)\arctan\left(\frac{5}{7}\right)$. May be implied by awrt $35.5°$ or a value for θ of awrt $17.8°$ **provided M1 has been scored.** Condone in radians.

dM1: Proceeds to find at least one value for θ Condone slips but the correct order of operations is required. May be implied by one correct value or truncated $17.7°$ (which may be in radians). You may need to check this on your calculator.

A1: $(\theta=)$ awrt $17.8°, 107.8°$ and no others inside the range **following all previous marks scored** (must be in degrees but condone the omission of the degrees symbol). Isw if they round incorrectly following correct answers seen.

Alt(i) Squaring both sides

M1: Squares both sides and uses $\pm\sin^2 x \pm \cos^2 x = \pm 1$ to produce a quadratic equation in $\sin x$ or $\cos x$. Condone slips on the coefficients when squaring.

A1: $\left(49\sin^2 2\theta = 25(1-\sin^2 2\theta) \Rightarrow\right)\ 74\sin^2 2\theta = 25$ oe or

$\left(49(1-\cos^2 2\theta) = 25\cos^2 2\theta \Rightarrow\right)\ 74\cos^2 2\theta = 49$ oe

dM1:Proceeds to find at least one value for θ Condone slips but the correct order of operations is required.

May be implied by one correct value or truncated $17.7°$ (which may be in radians). You may need to check this on your calculator.

A1: $\left(\theta =\right)$ awrt $17.8°, 107.8°$ and no others inside the range **following all previous marks scored** (must be in degrees but condone the omission of the degrees symbol) Isw if they round incorrectly following correct answers seen.

(ii) Note that answers only with no working seen scores 0 marks

M1: Uses the identity $\tan x = \dfrac{\sin x}{\cos x}$ and moves to an equation of the type $A\sin x = B\cos^2 x$ oe

dM1: Uses $\pm\cos^2 x = \pm 1 \pm \sin^2 x$ to produce a quadratic equation in $\sin x$. Terms do not need to be collected on one side of the equation for this mark but any brackets should be multiplied out.

A1: $5\sin^2 x + 24\sin x - 5 = 0$ oe (terms do not need to be on one side for this mark but if they are then the = 0 may be implied by further work)

ddM1:Attempts to solve their 3TQ in $\sin x$ which may be directly via a calculator. You may need to check this. It cannot be implied by correct angles for their roots to the quadratic.

A1: Both (awrt) $\left(x =\right)$ $0.201, 2.940$ and no others inside the range **following the award of the previous 4 marks.** Must be in radians. Isw if they round incorrectly following correct answers seen. Note 2.941 is A0

Question Number	Scheme	Marks
8(a)	$y=(x+2)^2(4-x)=\left(x^2+4x+4\right)(4-x)=\left(16+12x-x^3\right)$	M1
	Area $=\left[16x+6x^2-\frac{1}{4}x^4\right]_{(-2)}^{(4)}$	dM1A1ft
	$=[64+96-64]-[-32+24-4]=108$	ddM1A1
		(5)
(b)	Attempts $4.5\times(a)=486$	B1ft
	Gives a valid reason why the area is 4.5 times greater	B1
		(2)
		(7 marks)

(a) Note that if no integration is seen then maximum score is M1dM0A0ftddM0A0. Attempts at integration by parts send to review.

M1: Attempts to multiply out **to achieve a cubic**. Look for:

eg $y=(x+2)^2(4-x)=\left(x^2+...+4\right)(4-x)=....$ or

$y=(x+2)(x+2)(4-x)=(x+2)\left(8.....-x^2\right)=....$

FYI: $y=16+12x-x^3$ which may be unsimplified.

dM1: Raises the power by one **in at least two terms**. Indices do not need to be processed for this mark. It is dependent on the first method mark.

A1ft: $16x+6x^2-\frac{1}{4}x^4$ follow through **on their cubic** which may be unsimplified. Indices must be processed – may be implied by further work.

ddM1:Uses the limits -2 and 4 and subtracts either way around. The expression with the limits substituted in (or may be partially evaluated) is sufficient to score (condone slips) or

$\left[16x+6x^2-\frac{1}{4}x^4\right]_{-2}^{4}=108$ can score both final marks.

It is dependent on both previous method marks. May be implied by 108 but if no method is shown and just a value stated that is not 108 then ddM0A0. May split the area into separate regions and add together.

A1: 108 provided all previous marks have been scored.