Question	Scheme	Marks	AOs
12(a)	States or uses $\tan x = \frac{\sin x}{\cos x}$	B1	1.2
	$4\sin x = 5\cos^2 x \Rightarrow 4\sin x = 5\left(1-\sin^2 x\right)$	M1	1.1b
	$5\sin^2 x + 4\sin x - 5 = 0$ *	A1*	2.1
		(3)	
(b)	Attempts to solve $5\sin^2 x + 4\sin x - 5 = 0 \Rightarrow \sin x = ...$	M1	1.1b
	$\sin x = \frac{-2 \pm \sqrt{29}}{5}$ $(\sin x = \text{awrt } 0.677)$	A1	1.1b
	Takes $\sin^{-1}$ leading to at least one answer in the range	dM1	1.1b
	$x = \text{awrt } 42.6\{°\}$ and $x = \text{awrt } 137.4\{°\}$ only	A1	1.1b
		(4)	
(c)	$15 \times "2" = 30$ following through on their "2"	B1ft	2.2a
	Explains either "mathematically" by stating $3 \times 5 \times$ their number in range 0 to 360° or 'in words" e.g., stating 3 ×"2" values every 360° and 5 lots of 360°	B1ft	2.4
		(2)	
		(9 marks)	

Notes:

(a) **Allow use of e.g. θ but the final mark requires the equation to be in terms of x**

B1: States or uses $\tan x = \frac{\sin x}{\cos x}$ e.g., $4\tan x = 5\cos x \Rightarrow 4\frac{\sin x}{\cos x} = 5\cos x$ Allow e.g. $\tan x = \frac{\sin\theta}{\cos\theta}$

M1: Multiplies by $\cos x$ and uses $\cos^2 x = 1 - \sin^2 x$ to set up a quadratic equation in just $\sin x$
Condone mixed arguments here.

A1*: Proceeds to $5\sin^2 x + 4\sin x - 5 = 0$ with correct notation and algebra, showing all key steps.
The = 0 must be present in the final answer line.
Condone a single slip in notation, e.g., $\sin x^2$ or $\sin\theta$ seen once.

(b)

M1: Attempts to solve $5\sin^2 x + 4\sin x - 5 = 0 \Rightarrow$ **$\sin x = ...$** using the usual rules.
$\sin x =$ may be implied later.
Allow solution(s) from a calculator but one must be correct (0.6 or 0.7 or –1.4 or –1.5)

A1: Achieves $\sin x = \frac{-4 \pm \sqrt{116}}{10}$ $(\sin x = \text{awrt } 0.677)$ $\sin x =$ may be implied later.

dM1: Finds one value of x in the range 0 to 360° from their $\sin x =$
May be scored for working in radians. If using $\sin x =$ 0.677 they should have awrt 0.744 or awrt 2.40
If they have made a slip in solving the quadratic, e.g., by the formula, then their values will need checking both in degrees and radians to see if this mark can be implied.

A1: $x = \text{awrt } 42.6\{°\}$ and $x = \text{awrt } 137.4\{°\}$ only. Ignore any values outside of 0 to 360°

	isw if they round their values to e.g., 3sf after stating acceptable answers. There must be some evidence that the quadratic has been solved.
(c) **B1ft:** **B1ft:** **Note:**	 Follow through on 15 multiplied by the number of solutions in (b) in the range 0 to 360° If working in radians in (b), they must state 30 (solutions). Explains either mathematically **or** in words. See scheme. Note that you might see arguments expanding the range from 1800 to 5400 to account for the stretch parallel to the *x* axis. $\frac{5400}{360}=15$ and $15\times 2=30$ which is also acceptable. If candidates list 30 values and conclude that there are 30 solutions, score B1ftB1ft There is no need to check their 30 values are correct, but there must be 30.