Question	Scheme	Marks
4	$\log_4 a+\log_4 b=\log_4 ab$ or $\log_4 "ab"=3\Rightarrow "ab"=4^3$	**M1**
	$ab=K, a-b=8\Rightarrow a(a-8)=K$ or $(b+8)b=K$	**dM1**
	$a^2-8a-64=0$ or $b^2+8b-64=0$	**A1**
	$a=\frac{-(-8)+\sqrt{(-8)^2-4\times1\times-64}}{2\times1}=...$ or $b=\frac{-8+\sqrt{8^2-4\times1\times-64}}{2\times1}=...$	**M1**
	$a='4+4\sqrt{5}'\Rightarrow b=-4+4\sqrt{5}$	**M1**
	$a=4+4\sqrt{5}$ and $b=-4+4\sqrt{5}$ and no other solutions.	**A1**
		(6)
		(6 marks)

Notes:

M1: Correct addition law applied (may be implied) **or** undoes a log equation correctly, **or** replaces the 3 by $\log_4 4^3$ oe

The addition law may be seen after substitution from the first equation e.g.

$a-b=8\Rightarrow a=b+8\Rightarrow \log_4 a+\log_4 b=\log_4(b+8)+\log_4 b=\log_4 b(b+8)$

Condone $\log_4(b+8)+\log_4 b=\log_4 b^2+8b$

dM1: Removes logs correctly and proceeds from an equation of the form $ab=K$ and the given equation $a-b=8$ to a quadratic equation in either *a* or *b*.

A1: Correct quadratic equation. Brackets must be expanded but terms not necessarily all on one side. The " =0" may be implied by their attempt to solve.

M1: Solves a 3TQ in *a* or *b* to obtain a positive solution. There is no need to see the negative solution in their working.

M1: Uses their *a* to find *b* or vice versa. This depends on having solved a 3TQ earlier and obtained a root of the form $p+q\sqrt{r},\ p,q,r\neq0$ to obtain another root of a similar form i.e. not a decimal.

The value of *a* or *b* does not necessarily have to be positive for this mark.

Note that having found *a* or *b* they may repeat the process above to find the other value which is acceptable.

A1: Both of $a=4+4\sqrt{5}$ and $b=-4+4\sqrt{5}$ simplified, with no other solutions.

Apply isw once correct answers are seen, e.g. if they subsequently go into decimals.

Question	Scheme	Marks
5	$3\tan(\theta+43°)=2\cos(\theta+43°)\Rightarrow 3\dfrac{\sin(\theta+43°)}{\cos(\theta+43°)}=2\cos(\theta+43°)$ $\Rightarrow 3\sin(\theta+43°)=2\cos^2(\theta+43°)$	**M1**
	$\Rightarrow 3\sin(\theta+43°)=2\left(1-\sin^2(\theta+43°)\right)$	**M1**
	$\Rightarrow 2\sin^2(\theta+43°)+3\sin(\theta+43°)-2=0$ $\Rightarrow \left(2\sin(\theta+43°)-1\right)\left(\sin(\theta+43°)+2\right)=0\Rightarrow \sin(\theta+43°)=...$	**M1**
	$\sin(\theta+43°)=\dfrac{1}{2}$	**A1**
	$\theta=\arcsin"\dfrac{1}{2}"-43°$	**M1**
	$\theta=-13°,\ 107°$	**A1**
		(6)
		(6 marks)

Notes:

M1: Uses $\tan..=\dfrac{\sin..}{\cos..}$ and multiplies through to form an equation of the form $A\sin...=B\cos^2...$

Condone poor notation e.g.:

$3\tan(\theta+43°)=2\cos(\theta+43°)\Rightarrow 3\dfrac{\sin}{\cos}(\theta+43°)=2\cos(\theta+43°)$

$\Rightarrow 3\sin(\theta+43°)=2\cos^2(\theta+43°)$ (with or without brackets)

M1: Applies Pythagorean identity to obtain a 3 term quadratic equation in sin.

Allow use of $\cos^2...=\pm1\pm\sin^2...$

M1: Solves a 3 term quadratic in $\sin(\theta+43°)$ by any valid means.

This may be implied by at least one correct root for their quadratic.

Allow if they have $\sin(\theta+43°)=x$ or another variable or e.g. sin α where $\alpha=\theta+43°$

A1: Correct value of $\sin(\theta+43°)$. If $\sin(\theta+43°)=x$ is used, it must be clear they mean $\sin(\theta+43°)$ but this may be implied if they have e.g. sin α = ½ where $\alpha=\theta+43°$

If $x=\dfrac{1}{2}$ is left as a final answer it is A0.

M1: Correct method for solving $\sin(\theta+43°)=k, |k|<1$, look for use of inverse sine followed by **subtraction** of 43 from $\sin^{-1}(\text{their } k)$. Implied by one correct solution for their *k*

Do **not** allow mixing of degrees and radians for this mark.

A1: Correct solutions and no others in the range.