Question	Scheme	Marks	AOs
2(a)	$z=\cos\theta+\mathrm{i}\sin\theta \Rightarrow \dfrac{1}{z}=\cos\theta-\mathrm{i}\sin\theta$ $\Rightarrow\left(z+\dfrac{1}{z}\right)^5=(2\cos\theta)^5=32\cos^5\theta$	M1	2.1
	$\left(z+\dfrac{1}{z}\right)^5=z^5+\dfrac{1}{z^5}+5\left(z^3+\dfrac{1}{z^3}\right)+10\left(z+\dfrac{1}{z}\right)$	M1 A1	2.1 1.1b
	$=2\cos5\theta+10\cos3\theta+20\cos\theta$	M1	2.1
	$\cos^5\theta=\dfrac{1}{16}(\cos5\theta+5\cos3\theta+10\cos\theta)$*	A1*	1.1b
		(5)	
(b)	$\cos\theta-\cos5\theta=5\cos3\theta \Rightarrow \cos\theta=5\cos3\theta+\cos5\theta=16\cos^5\theta-10\cos\theta$	M1	3.1a
	$16\cos^5\theta-11\cos\theta=0$	A1	1.1b
	$\cos\theta\left(16\cos^4\theta-11\right)=0\Rightarrow\cos\theta=0,\ \pm\sqrt[4]{\dfrac{11}{16}}$	M1	1.1b
	$\theta=3.57,\dfrac{3\pi}{2}(\text{or } 4.71),5.86$	A1 A1	1.1b 1.1b
		(5)	
			(10 marks)

Notes

(a)

M1: Begins the proof by demonstrating that $\left(z+\dfrac{1}{z}\right)^5=32\cos^5\theta$

M1: Attempts to expand $\left(z+\dfrac{1}{z}\right)^5$ including the binomial coefficients

A1: Correct expansion

M1: Uses $z^n+\dfrac{1}{z^n}=2\cos n\theta$ to obtain an expression in terms of $\cos5\theta$, $\cos3\theta$ and $\cos\theta$

A1*: Concludes the argument by equating the two expressions leading to the printed answer with no errors

(b)

M1: Makes the connection with part (a) and reaches an equation in cosθ only

A1: Correct equation

M1: Solves their equation for cosθ

A1: 2 correct solutions

A1: All 3 correct solutions. Ignore extra solutions outside the range but deduct this mark if there are extra answers in range.