Question	Answer	Marks	Guidance
6(a)	$\dfrac{\dfrac{\cos\theta}{\sin\theta}+\dfrac{\sin\theta}{\cos\theta}}{\dfrac{1}{\cos\theta}}$ soi	**2**	**B1** for $\tan\theta$ and $\cot\theta$ in terms of sin and cos. **B1** for $\sec\theta=\dfrac{1}{\cos\theta}$
	$\dfrac{\cos^2\theta+\sin^2\theta}{\sin\theta\cos\theta}\times\cos\theta$ soi oe	**M1**	For dealing with the fractions in the numerator.
	$\dfrac{1}{\sin\theta}\times\text{cosec}\,\theta$ cso	**A1**	For correct use of $\cos^2\theta+\sin^2\theta=1$ to obtain the given answer.
	$\dfrac{\dfrac{1}{\tan\theta}+\tan\theta}{\dfrac{1}{\cos\theta}}=\dfrac{1+\tan^2\theta}{\tan\theta}\times\cos\theta$ soi oe	**(2)**	**B1** for $\sec\theta=\dfrac{1}{\cos\theta}$ **M1** for dealing with the fractions in the numerator.
	$\dfrac{\sec^2\theta}{\tan\theta}\times\cos\theta$	**(B1)**	For correct use of $\tan^2\theta+1=\sec^2\theta$
	$\dfrac{1}{\sin\theta}\times\text{cosec}\,\theta$ cso	**(A1)**	For correct use of $\tan\theta$ and $\sec^2\theta$ to obtain the given answer.
6(b)	$\left(\dfrac{1}{\sin\frac{\phi}{3}}\right)^2=2$ or $\sin\dfrac{\phi}{3}=\pm\dfrac{1}{\sqrt{2}}$ soi or $\tan\dfrac{\phi}{3}=\pm1$ soi	**B2**	**B1** for ± missing
	–405°, –135°, 135°, 405°	**4**	**M1** for one correct positive or negative solution of *their* $\sin\dfrac{\phi}{3}=k$ **A1** for another correct solution **M1Dep** for one negative or positive solution **A1** for another correct solution and no extras in the range.
7(a)(i)	6435	**B1**	Must be evaluated not just ${}^{15}C_8$
7(a)(ii)	With family of 4: 330	**B1**	Must be evaluated not just ${}^{11}C_4$ or implied by a correct answer
	Without family of 4: 165	**B1**	Must be evaluated not just ${}^{11}C_8$ or implied by a correct answer
	Total: 495	**B1**	

Question	Answer	Marks	Guidance
7(b)	$\frac{(n+9)\times n!}{(n-10)!}=\frac{(n^2+243)(n-1)!}{(n-1-9)!}$ $n(n+9)=n^2+243$ oe	**2**	**B1** for either ${}^nP_{10}=\frac{n!}{(n-10)!}$ *or* ${}^nP_{10}=\frac{(n-1)!}{(n-1-9)!}$ **B1 dep** for $n(n+9)=n^2+243$
	$n=27$	**B1**	
8(a)	$\frac{(2x+1)\times\frac{1}{3}\times3(3x-4)^{-\frac{2}{3}}-2(3x-4)^{\frac{1}{3}}}{(2x+1)^2}$ oe or by using the product rule $\frac{1}{3}\times3\times(3x-4)^{-\frac{2}{3}}\times(2x+1)^{-1}+-2\times$ $(2x+1)^{-2}(3x-4)^{\frac{1}{3}}$	**3**	**B1** for $\frac{1}{3}\times3\times(3x-4)^{-\frac{2}{3}}$ oe **M1** for an attempt to differentiate a quotient. **A1** for all terms other than $\frac{1}{3}\times3\times(3x-4)^{-\frac{2}{3}}$ correct. Allow unsimplified.
	$\frac{(3x-4)^{-\frac{2}{3}}}{(2x+1)^2}$ $((2x+1)-2(3x-4))$	**M1**	**M1 dep** for attempt to factorise, must be in the form $\frac{(3x-4)^{-\frac{2}{3}}}{(2x+1)^2}$ $[(ax+1)-b(3x-4)]$
	$\frac{9-4x}{(2x+1)^2(3x-4)^{\frac{2}{3}}}$	**A1**	
8(b)	(2.25, 0.255)	**2**	**B1 FT** for *their* x-coordinate only. Do not allow **FT** if they score **M0** in part **(a)**
9(a)	$n=57$ cso	**3**	**B1** for $\frac{n}{2}(2\ln q+3(n-1)\ln q)$ oe soi Allow if in indices form i.e.: $\frac{n}{2}(\ln q^2+(n-1)\ln q^3)$ **B1** for $3n^2-n-9690=0$ oe soi
9(b)	Common ratio $=p^{-2x}$	**B1**	Allow unsimplified
	nth term $=p^{3x}(p^{-2x})^{n-1}$ soi	**B1**	Allow unsimplified
	$p^{(5-2n)x}$	**B1**	