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**	

Question	Answer	Marks	Guidance
9(c)	Common ratio = $\frac{4}{3}\cos^2 3\theta$	**B1**	Allow unsimplified. Must be convinced it is the common ratio not just writing the first term e.g. $r =$ or seeing $\frac{\frac{16}{9}\cos^4 3\theta}{\frac{4}{3}\cos^2 3\theta}$
	$\frac{4}{3}\cos^2 3\theta(*) - 1$ or $\frac{4}{3}\cos^2 3\theta(*)\ 1$ or oe soi $\frac{4}{3}\cos^2 3\theta(*)\ 0$	**B1**	
	$\cos 3\theta(*)\frac{\sqrt{3}}{2}$ or $\cos 3\theta(*) - \frac{\sqrt{3}}{2}$ or soi $\cos 3\theta(*)\ 0$	**B1**	
	$3\theta(*)\frac{5\pi}{6}$ **and** $3\theta(*)\frac{\pi}{6}$ soi	**B1**	Seeing $\frac{5\pi}{18}$ or $\frac{\pi}{18}$ implied the first 3 marks
	$\frac{\pi}{18} < \theta \leqslant \frac{5\pi}{18}$	**B1**	
10(a)	$\frac{dy}{dx} = 2\times 3(3x+1)\ln(3x+1) + \frac{3(3x+1)^2}{3x+1}$ Simplified to: $\frac{dy}{dx} = 3(3x+1)(1+2\ln(3x+1))$	**3**	**B1** for $\frac{3}{3x+1}$ **M1** for attempt to differentiate a product **A1** for all terms other than $\frac{3}{3x+1}$ correct. Allow unsimplified.
10(b)	$k(3x+1)^2\ln(3x+1)$ soi	**B1**	
	$\int(3x+1)dx = \frac{3x^2}{2} + x\ (+c)$	**B1**	May be a multiple May be seen as $\frac{1}{3}\times\frac{1}{2}\times(3x+1)^2$
	$\frac{1}{6}(3x+1)^2\ln(3x+1) - \frac{3x^2}{4} - \frac{x}{2} + c$	**B2**	**B1** for two correct algebraic terms For **B2** must have (+ c)