Question	Answer	Marks	Guidance
9(b)	$e^{3y-7+3y-1}+4e^{-3+3y-1}=5$ oe or $e^{3y-4+3y-1}+4e^{3y-1}=5e^{3}$ or $e^{3y-7}+\frac{4}{e^{3}}=5e^{1-3y}$ or $e^{6y}+4e^{4+3y}=5e^{8}$ or $\frac{e^{3y}}{e^{7}}+\frac{4}{e^{3}}=\frac{5e}{e^{3y}}$ or $\frac{e^{3y-1}}{e^{6}}+\frac{4}{e^{3}}=\frac{5}{e^{3y-1}}$	**B1**	
	$e^{6y-8}+4e^{3y-4}-5\ [=0]$ or $e^{3y-4}+4-5e^{4-3y}[=0]$ or $e^{-7}\left(e^{3y}\right)^{2}+4e^{-3}e^{3y}-5e[=0]$ or $\left(e^{3y-1}\right)^{2}+4e^{3}e^{3y-1}-5e^{6}[=0]$	**B1**	**Dep** for arranging as 3-term quadratic
	$\left(e^{3y-4}-1\right)\left(e^{3y-4}+5\right)=0$ or $\left(e^{-3}\left(e^{3y}\right)-e\right)\left(e^{-4}\left(e^{3y}\right)+5\right)=0$ or $(e^{3y-1}+5e^{3})(e^{3y-1}-e^{3})=0$	**M1**	**Dep** for an attempt at solution
	$e^{3y-4}=1$ or $e^{3y-1}=e^{3}$	**A1**	
	$3y-4=\ln 1$ oe soi or $3y-1=3$	**A1**	
	$y=\frac{4}{3}$	**A1**	
10(a)	$\frac{20}{2}(2a+19d)=3\times\frac{10}{2}(2a+9d)$ oe	**M1**	
	$20a+190d=30a+135d$ oe	**A1**	Correct removal of brackets
	$a=\frac{11}{2}d$ oe	**A1**	

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Question	Answer	Marks	Guidance
10(b)	$S_A = \frac{a_1}{1-r}$ soi	**B1**	Allow a for a_1
	$r_b = r^2$ soi	**B1**	
	$S_B = \left[\frac{a_2}{1-r^2}\right] = \frac{a_1 r}{1-r^2}$	**B1**	Allow a for a_1 with r^2
	$k = \frac{S_B}{S_A} = \frac{a_1 r}{1-\textit{their } r^2} \times \frac{1-r}{a_1}$ $\frac{S_B}{S_A} = \frac{\frac{a_1 r}{1-\textit{their } r^2}}{\frac{a_1}{1-r}}$	**M1**	**Dep** on the first and second **B1** for *their* $\frac{S_B}{S_A}$ Allow a for a_1
	$\frac{r}{1+r}$ cao	**A1**	
11(a)	Centre (2, 1)	**B1**	Accept $x = 2$ and $y = 1$
	Radius 2 soi	**B1**	
	$(x-2)^2 + (y-1)^2 = 4$ oe	**B1**	**FT** *their* centre and radius ISW Do not accept 2^2 for 4
11(b)	$(x-2)^2 + (2x + a - 1)^2 = 4$	**M1**	Substitute $y = 2x + a$ into *their* circle equation
	$x^2 - 4x + 4 + 4x^2 + 4(a-1)x + (a-1)^2 = 4$	**A1**	Equivalent must be seen as **AG**
	leading to $5x^2 + 4(a-2)x + (a-1)^2 = 0$ **AG**		
	$16(a-2)^2 - 20(a-1)^2 = 0$	**M1**	for finding the discriminant of the given equation and equating to zero
	$a^2 + 6a - 11 = 0$ $a = -3 \pm \sqrt{20}$ or $\frac{-6 \pm \sqrt{80}}{2}$ oe	**A1**	isw from a correct answer isw
12(a)	${}^{59}C_r 2^{59-r}\left[x^r\right]$ oe	**B1**	Allow for $\binom{59}{r}2^{59-r}$ or $\frac{59!}{(59-r)!r!}\ 2^{59-r}$

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