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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Question	Answer	Marks	Guidance
12(b)	$\frac{59!}{(59-r)!r!}2^{59-r}$ $= \frac{59!}{(58-r)!(r+1)!}2^{58-r}$ oe	**B1**	Allow if in terms of n and r e.g.: $\frac{n!}{(n-r)!r!}2^{n-r} =$ $\frac{n!}{(n-(r+1))!(r+1)!}2^{n-(r+1)}$
	$\frac{2}{59-r} = \frac{1}{1+r}$	**B2**	**Dep** on previous **B1** for correctly obtaining either $\frac{2}{59-r}$ or $\frac{1}{r+1}$
	$r = 19$	**B1**	**Dep** on previous **B1** marks

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