Question Number	Scheme	Marks
5 (a)(i)	If $y = 0$ then $1-(\alpha+\beta y^2)=0 \quad \therefore \ \alpha = 1$ *	B1cso
(ii)	If $y = 5$ then $1-(\alpha+\beta y^2)=1$	
	$1+25\beta=0 \quad \therefore \beta=-\frac{1}{25}$ *	B1cso
		(2)
(b)	$F(y)=\frac{1}{25}y^2$ so $f(y)=\frac{dF(y)}{dy}=\frac{2}{25}y$	M1
	$\therefore [f(y)=]\begin{cases}\frac{2}{25}y & 0\leqslant y\leqslant 5\\ 0 & \text{otherwise}\end{cases}$	A1
		(2)
(c)	$\left[P\left(R>\frac{11}{5}\right)=P\left(Y>\frac{5}{3}\right)=1-\frac{1}{25}\times\left(\frac{5}{3}\right)^2=\right]\ \underline{\underline{\frac{8}{9}}}$ oe	B1
	$\frac{3d-\frac{11}{5}}{3d-d}=\frac{8}{9}$ oe or $\frac{\frac{11}{5}-d}{3d-d}=\frac{1}{9}$ oe	M1
	$d=\underline{\underline{\frac{9}{5}}}$ oe	A1
		(3)
(d)	$P\left(Y<\frac{11}{5}\right)=\frac{121}{625}$ or 0.1936	B1
	[Let G = the number of spins with distance < 2.2 m]	
	$[P(G\geqslant 5)=]$	
	$\left(\frac{"1"}{9}\right)^3\times\left(\frac{"121"}{625}\right)^3+3\times\left(\frac{"1"}{9}\right)^2\times\left(\frac{"8"}{9}\right)\times\left(\frac{"121"}{625}\right)^3+3\times\left(\frac{"1"}{9}\right)^3\times\left(\frac{"121"}{625}\right)^2\times\left(\frac{"504"}{625}\right)$	M1, M1
	= 0.000 373226 awrt **0.000 373**	A1
		(4)
		Total 11

Notes

(a) (i) **B1:** for stating or using the fact that when $y = 0$ then $\alpha+\beta y^2 = 1$

(ii) **B1:** for stating or using that when $y = 5$ then $\alpha+\beta y^2 = 0$ and setting up the equation leading to $\beta=-\frac{1}{25}$

(b) **M1:** for differentiating. Implied by $\pm\frac{2}{"25"}y$ can ft their value of β

A1: for a fully correct f(y) defined for the whole range.

(c) **B1:** for using F(y) and $\frac{5}{3}$ to find P($Y > \frac{5}{3}$). Allow $\frac{8}{9}$ or any exact equivalent.

M1: for LHS = p where $0 < p < 1$

A1: for $\frac{9}{5}$ or any exact equivalent e.g. 1.8

(d) **B1:** for $\frac{121}{625}$ or awrt 0.194 This mark could be implied by a correct answer.

1st M1: for $p^3q^3+np^2(1-p)q^3+np^3q^2(1-q)$ where p and q are probabilities and n is an integer > 0

2nd M1: for $p^3q^3+3p^2(1-p)q^3+3p^3q^2(1-q)$ where p and q are probabilities.

A1: for awrt 0.000 373