Question Number	Scheme	Marks
4.	[A = the number on the ball] $\mathrm{P}(A=1)=\frac{2}{9}$ $\mathrm{P}(A=2)=\frac{1}{3}$ $\mathrm{P}(A=5)=\frac{4}{9}$	B1
(i)	Possible samples with a range of 4 are: (1,1,5) (1,2,5) (1,5,5)	M1
	(1,1,5) $"\frac{2}{9}" \times "\frac{2}{9}" \times "\frac{4}{9}" \times 3 = \frac{16}{243}$ or (1,5,5) $"\frac{2}{9}" \times "\frac{4}{9}" \times "\frac{4}{9}" \times 3 = \frac{32}{243}$	M1
	(1,2,5) $"\frac{2}{9}" \times "\frac{1}{3}" \times "\frac{4}{9}" \times 6 = \frac{16}{81}$	M1
	$\mathrm{P}(B=4)=\frac{16}{243}+\frac{32}{243}+\frac{16}{81} = \underline{\underline{\frac{32}{81}}}$	A1
(ii)	$\mathrm{P}(B=0)=\left("\frac{2}{9}"\right)^3+\left("\frac{1}{3}"\right)^3+\left("\frac{4}{9}"\right)^3=\frac{11}{81}$	M1
	$\mathrm{P}(B=1)=3\times\frac{2}{9}\times\left(\frac{1}{3}\right)^2+3\times\frac{1}{3}\times\left(\frac{2}{9}\right)^2=\frac{10}{81}$ or $\mathrm{P}(B=3)=3\times\frac{1}{3}\times\left(\frac{4}{9}\right)^2+3\times\frac{4}{9}\times\left(\frac{1}{3}\right)^2=\frac{28}{81}$	M1
	$1-"\frac{11}{81}"-"\frac{10}{81}"-"\frac{32}{81}"=\frac{28}{81}$ or $1-"\frac{11}{81}"-"\frac{28}{81}"-"\frac{32}{81}"=\frac{10}{81}$	M1
	b | 0 | 1 | 3 | 4 $\mathrm{P}(B=b)$ | $\frac{11}{81}$ | $\frac{10}{81}$ | $\frac{28}{81}$ | $\frac{32}{81}$	B1 A1
		(10)
		Total 10

	Notes
(i)	**B1:** for writing or using the 3 correct probabilities
	1st M1: for identifying the 3 possible samples
	2nd M1: for $p\times p\times q\times 3$ or $p\times q\times q\times 3$ where p and q are probabilities with $(p+q)<1$
	3rd M1: for $p\times q\times r\times 6$ where p, q and r are probabilities with $(p+q+r)=1$
	A1: for $\frac{32}{81}$ or awrt 0.395 [Calc: 0.3950617…]
(ii)	**1st M1:** for $p^3+q^3+r^3$ (for their p, q and r)
	2nd M1: for $3\times p\times(q)^2+3\times q\times(p)^2$ or $3\times q\times(r)^2+3\times r\times(q)^2$ (for their p, q and r)
	3rd M1: for use of all probabilities of P(B = b) adding to 1 [Must have 3, 4 or 5 values for b]
	B1: for ranges 0, 1, 3 and 4 with none omitted and no extras. Allow extras if assigned probability of 0
	A1: for a fully correct probability distribution.
SC A0 in (i)	If A0 scored in (i) and all other marks scored in (ii) and correct prob's for 2 values of b : award A1 in (ii)