Question	Answer	Marks	Guidance
(a)	YYY: $\frac{5}{12}\times\frac{4}{11}\times\frac{3}{10} = \frac{60}{1320}, \frac{1}{22}$ OOO: $\frac{4}{12}\times\frac{3}{11}\times\frac{2}{10} = \frac{24}{1320}, \frac{1}{55}$ RRR: $\frac{3}{12}\times\frac{2}{11}\times\frac{1}{10} = \frac{6}{1320}, \frac{1}{220}$	**M1**	**Either** $12 \times 11 \times 10$ in denominator **or** $a \times (a-1) \times (a-2)$, $a = 5, 4, 3$ in numerator seen in at least one expression.
		A1	One expression $\frac{a}{12}\times\frac{a-1}{11}\times\frac{a-2}{10}$, $a = 5, 4, 3$ (consistent in expression). Correct order of values in the numerator is essential.
		M1	$\frac{5}{12}\times\frac{4}{d}\times\frac{3}{e}+\frac{4}{12}\times\frac{3}{d}\times\frac{2}{e}+\frac{3}{12}\times\frac{2}{d}\times\frac{1}{e}$, either $d = 11$, $e = 10$ or $d = 12$, $e = 12$. Condone $\frac{1}{22}+\frac{1}{55}+\frac{1}{220}$ OE
	[Total =] $\frac{90}{1320}, \frac{3}{44}, 0.0682$	**A1**	0.06818. Dependent only upon the second M mark.

Question	Answer	Marks	Guidance
(a)	**Alternative method for question (a)**		
	YYY: $\frac{{}^{5}C_{3}}{{}^{12}C_{3}} = \frac{10}{220}, \frac{1}{22}$ OOO: $\frac{{}^{4}C_{3}}{{}^{12}C_{3}} = \frac{4}{220}, \frac{1}{55}$ RRR: $\frac{{}^{3}C_{3}}{{}^{12}C_{3}} = \frac{1}{220}$	**M1**	Either ${}^{12}C_{3}$ in denominator or ${}^{a}C_{3}$ in numerator seen in at least one expression.
		A1	One expression $\frac{{}^{a}C_{3}}{{}^{12}C_{3}}$ $a = 5, 4, 3$
		M1	$\frac{{}^{5}C_{3}}{{}^{12}C_{3}} + \frac{{}^{4}C_{3}}{{}^{12}C_{3}} + \frac{{}^{3}C_{3}}{{}^{12}C_{3}}$ Condone $\frac{1}{22} + \frac{1}{55} + \frac{1}{220}$ OE
	[Total =] $\frac{90}{1320}, \frac{3}{44}, 0.0682$	**A1**	0.06818. Dependent only upon the second M mark.
		4	
(b)	[P(YYY | all same colour) =] $\frac{60}{1320} \div \frac{90}{1320}$	**M1**	$\frac{\textit{their}\,\mathrm{P(YYY)} \text{ or } \frac{60}{1320} \text{ or } \frac{1}{22}}{\textit{their}\,7(\mathrm{a}) \text{ or } \frac{90}{1320} \text{ or } \frac{3}{44}}$
	$\frac{2}{3}$, 0.667	**A1**	OE
		2	

Question	Answer	Marks	Guidance
(c)	In each method, the M mark requires the scenarios to be identifiable. This may be implied by a list of scenarios and then the calculations which will be assumed to be in the same order. A correct value/expression will be condoned as identifying the connected scenario.		
	Method 1		
	[1 – no orange =] $1-\frac{8}{12}\times\frac{7}{11}\times\frac{6}{10}$ or $1-\frac{{}^{8}C_{3}}{{}^{12}C_{3}}=1-\frac{14}{55}$	**B1**	$\frac{8}{12}\times\frac{7}{11}\times\frac{6}{10}$ or $\frac{{}^{8}C_{3}}{{}^{12}C_{3}}$ seen, condone $\frac{336}{1320}$ or $\frac{56}{220}$ only, not OE.
		M1	$1-\frac{f}{12}\times\frac{g}{d}\times\frac{h}{e}$ Either $d = 11$, $e = 10$ or $d = 12$, $e = 12$ or 1 - $\frac{{}^{8}C_{3}}{{}^{12}C_{3}}$. Condone $1-\frac{14}{55}$ OE (not $\frac{41}{55}$).
	$\frac{41}{55}$	**A1**	$0.745 \leqslant p \leqslant 0.74545$ If M0 scored **SC B1** $0.745 \leqslant p \leqslant 0.74545$.

Question	Answer	Marks	Guidance
(c)	**Method 2**		
	P(1 O)= $\left(\frac{4}{12}\times\frac{3}{11}\times\frac{2}{10}+\frac{4}{12}\times\frac{5}{11}\times\frac{4}{10}+2\times\frac{4}{12}\times\frac{5}{11}\times\frac{3}{10}\right)\times 3=\frac{672}{1320}$ P(2O) = $\frac{4}{12}\times\frac{3}{11}\times\frac{8}{10}\times 3=\frac{288}{1320}$ P(3O) = $\frac{24}{1320}$	**B1** **M1**	P(1 O)or P(2 O) correct, accept unsimplified. 3 correct scenarios added, with at least one 3-term product of form $\frac{f}{12}\times\frac{g}{d}\times\frac{h}{e}$ seen, either $d = 11$, $e = 10$ or $d = 12$, $e = 12$.
	[Total =] $\frac{984}{1320}=\frac{41}{55}$, 0.745	**A1**	$0.745 \leqslant p \leqslant 0.74545$ If M0 scored **SC B1** $0.745 \leqslant p \leqslant 0.74545$.
	Method 3		
	O Y R = ${}^4C_1 \times {}^5C_1 \times {}^3C_1$ = 60 O R R = ${}^4C_1 \times {}^3C_2$ = 12 O Y Y = ${}^4C_1 \times {}^5C_2$ = 40 O O Y = ${}^4C_2 \times {}^5C_1$ = 30 O O R = ${}^4C_2 \times {}^3C_1$ = 18 O O O = ${}^4C_3$ = 4 Total = 164 Prob = $\frac{164}{{}^{12}C_3}$	**B1** **M1**	Number of ways either 1 or 2 orange sweets obtained correctly (112 or 48). Accept unsimplified Note ${}^4C_1 \times {}^8C_2 = 112$ or ${}^4C_2 \times {}^8C_1 = 48$ are correct alternatives. 3 correct scenarios (1, 2 or 3 orange sweets) added on numerator, denominator ${}^{12}C_3$
	$\frac{984}{1320}=\frac{41}{55}$, 0.745	**A1**	$0.745 \leqslant p \leqslant 0.74545$ If M0 scored **SC B1** $0.745 \leqslant p \leqslant 0.74545$.

Question	Answer	Marks	Guidance
(c)	**Method 4**		
	P(R R O) = $\frac{3}{12}\times\frac{2}{11}\times\frac{4}{10}=\frac{1}{55}$ P(R O) = $\frac{3}{12}\times\frac{4}{11}=\frac{1}{11}$ P(R Y O) = $\frac{3}{12}\times\frac{5}{11}\times\frac{4}{10}=\frac{1}{22}$ P(O) = $\frac{4}{12}=\frac{1}{3}$ P(Y R O) = $\frac{5}{12}\times\frac{3}{11}\times\frac{4}{10}=\frac{1}{22}$ P(Y O) = $\frac{5}{12}\times\frac{4}{11}=\frac{5}{33}$ P(Y Y O) = $\frac{5}{12}\times\frac{4}{11}\times\frac{4}{10}=\frac{2}{33}$	**B1**	P(R ^ ^) = $\frac{17}{110}$ or P(Y ^ ^) = $\frac{17}{66}$. Accept unsimplified.
		M1	3 correct scenarios added, with at least one 3-term product of form $\frac{f}{12}\times\frac{g}{d}\times\frac{h}{e}$ seen, either $d = 11$, $e = 10$ or $d = 12$, $e = 12$.
	$\frac{984}{1320}=\frac{41}{55}$, 0.745	**A1**	$0.745 \leqslant p \leqslant 0.74545$ If M0 scored **SC B1** $0.745 \leqslant p \leqslant 0.74545$.

Question	Answer	Marks	Guidance
(c)	**Method 5**		
	$P(O\quad) = \frac{4}{12} = \frac{1}{3}$ $P(\hat{}\ O\quad) = \frac{8}{12} \times \frac{4}{11} = \frac{8}{33}$ $P(\hat{}\ \hat{}\ O) = \frac{8}{12} \times \frac{7}{11} \times \frac{4}{10} = \frac{28}{165}$	**B1**	$P(\hat{}\ O\quad) = \frac{8}{33}$ or $P(\hat{}\ \hat{}\ O) = \frac{28}{165}$. Accept unsimplified.
		M1	3 correct scenarios added, with at least one 3-term product of form $\frac{f}{12} \times \frac{g}{d} \times \frac{h}{e}$ seen, either $d = 11$, $e = 10$ or $d = 12$, $e = 12$ with correct numerator.
	$\frac{984}{1320} = \frac{41}{55}$, 0.745	**A1**	$0.745 \leqslant p \leqslant 0.74545$ If M0 scored **SC B1** $0.745 \leqslant p \leqslant 0.74545$.
		3	