Question	Answer	Marks
1(a)	Prob of 4 (from 1,3, 3,1 or 2,2) = $\frac{3}{36} = \frac{1}{12}$ **AG**	**B1**
		1
1(b)	Mean = $\frac{1}{\frac{1}{12}} = 12$	**B1**
		1
1(c)	$\left(\frac{11}{12}\right)^5 \times \frac{1}{12} = 0.0539$ or $\frac{161051}{2985984}$	**B1**
		1
1(d)	$1 - \left(\frac{11}{12}\right)^7$	**M1**
	0.456 or $\frac{16344637}{35831808}$	**A1**
		2

Question	Answer	Marks
2(a)	6!	**M1**
	720	**A1**
		2
2(b)	Total number: $\frac{9!}{3!2!}(30240)$	**M1**
	Number with Ls together $= \frac{8!}{3!}(6720)$	**M1**
	Number with Ls not together $= \frac{9!}{3!2!} - \frac{8!}{3!}$ $= 30\,240 - 6720$	**M1**
	23 520	**A1**
	Alternative method for question 2(b)	
	$\frac{7!}{3!} \times \frac{8 \times 7}{2}$	
	$7! \times k$ in numerator, k integer ≥ 1	**M1**
	$8 \times 7 \times m$ in numerator or $8C2 \times m$, m integer ≥ 1	**M1**
	3! in denominator	**M1**
	23 520	**A1**
		4

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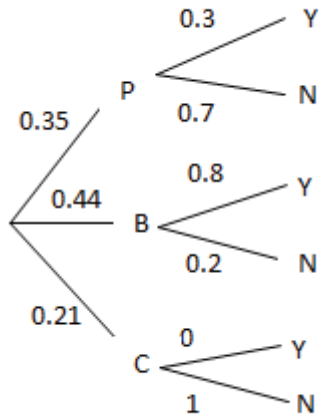
Question	Answer	Marks
3(a)	x: 0, 1, 2, 3 Probability: $\frac{1}{56}$, $\frac{15}{56}$, $\frac{30}{56}$, $\frac{10}{56}$ (**B1** for probability distribution table with correct outcome values)	**B1**
	$P(0)=\frac{3}{8}\times\frac{2}{7}\times\frac{1}{6}=\frac{1}{56}$ $P(1)=\frac{5}{8}\times\frac{3}{7}\times\frac{2}{6}\times 3=\frac{15}{56}$ $P(2)=\frac{5}{8}\times\frac{4}{7}\times\frac{3}{6}\times 3=\frac{30}{56}$ $P(3)=\frac{5}{8}\times\frac{4}{7}\times\frac{3}{6}=\frac{10}{56}$ (**M1** for denominator $8\times7\times6$)	**M1**
	Any one probability correct (with correct outcome)	**A1**
	All probabilities correct	**A1**
		4
3(b)	$1-P(8, 9, 10)=1-\left[{}^{10}C_8\,0.64^8 0.36^2+{}^{10}C_9\,0.64^9 0.36^1+0.64^{10}\right]$	**M1**
	$1-(0.164156+0.064852+0.11529)$	**M1**
	0.759	**A1**
		3

Question	Answer	Marks
4	Scenarios: 2P 3V 2G $^8C_2 \times {}^4C_2 \times {}^6C_3 = 28 \times 6 \times 20 = 3360$ 2P 4V 1G $^8C_2 \times {}^4C_1 \times {}^6C_4 = 28 \times 4 \times 15 = 1680$ 3P 3V 1G $^8C_3 \times {}^4C_1 \times {}^6C_3 = 56 \times 4 \times 20 = 4480$ 4P 2V 1G $^8C_4 \times {}^4C_1 \times {}^6C_2 = 70 \times 4 \times 15 = 4200$ (**M1** for $^8C_r \times {}^4C_r \times {}^6C_r$ with $\sum r = 7$)	**M1**
	Two unsimplified products correct	**B1**
	Summing the number of ways for 3 or 4 correct scenarios	**M1**
	Total: 13 720	**A1**
		4

Question	Answer	Marks
5(a)		
	Fully correct labelled tree for method of transport with correct probabilities.	**B1**
	Fully correct labelled branches with correct probabilities for lateness with either 1 branch after W or 2 branches with the prob 0	**B1**
		2
5(b)	$0.35 \times 0.3 + 0.44 \times 0.8 \, (+ 0)$	**M1**
	0.457	**A1**
		2

Question	Answer	Marks
5(c)	$\text{P(not B}\mid\text{not fruit)} = \dfrac{\text{P}(\text{B}'\cap\text{F}')}{\text{P}(\text{F}')}$	**M1**
	$\dfrac{0.35\times0.7+0.21\times1}{1-\textit{their}\,(\mathbf{b})}$	**M1**
	$\dfrac{0.455}{0.543}$ (**M1** for 1 – *their* **(b)** or summing three appropriate 2-factor probabilities, correct or consistent with *their* tree diagram as denominator)	**M1**
	0.838 or $\dfrac{455}{543}$	**A1**
		4

Question	Answer	Marks
6(a)	$\text{P}\left(\dfrac{50-54}{6.1}<z<\dfrac{60-54}{6.1}\right)=\text{P}\left(-0.6557<Z<0.9836\right)$	**M1**
	Both values correct	**A1**
	$\Phi\,(0.9836)-\Phi\,(-0.6557)=\Phi\,(0.9836)+\Phi\,(0.6557)-1$ $=0.8375+0.7441-1$ (Correct area)	**M1**
	0.582	**A1**
		4

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Question	Answer	Marks
6(b)	$\frac{45-\mu}{\sigma} = -0.994$	**B1**
	$\frac{56-\mu}{\sigma} = 1.372$	**B1**
	One appropriate standardisation equation with μ, σ, z-value (not probability) and 45 or 56.	**M1**
	$11 = 2.366\,\sigma$ (**M1** for correct algebraic elimination of μ or σ from *their* two simultaneous equations to form an equation in one variable)	**M1**
	$\sigma = 4.65$, $\mu = 49.6$	**A1**
		5

Question	Answer	Marks
7(a)	Class widths: 10, 5, 15, 20, 10	**M1**
	Frequency density = frequency/*their* class width: 1.8, 4.8, 2, 1, 0.8	**M1**
	All heights correct on diagram (using a linear scale)	**A1**
	Correct bar ends	**B1**
	Bar ends: 10.5, 15.5, 30.5, 50.5, 60.5	**B1**
		5
7(b)	11 – 15 and 31 – 50	**B1**
	Greatest IQR = 50 – 11 = 39	**B1**
		2
7(c)	$\text{Mean} = \frac{18\times5.5+24\times13+30\times23+20\times40.5+8\times55.5}{100} = \frac{2355}{100} = 23.6$	**B1**
	$\text{Var} = \frac{18\times5.5^2+24\times13^2+30\times23^2+20\times40.5^2+8\times55.5^2}{100} - \text{mean}^2$	**M1**
	$\frac{77917.5}{100} - \text{mean}^2 = 224.57$	**A1**
	Standard deviation = 15.0 (**FT** *their* variance)	**A1 FT**
		4

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