Question	Answer	Marks	Guidance
1(i)	$0.6 \times 0.2 + 0.4 \times 0.32$	**M1**	Addition of 2 two-factor terms $0.6 \times a + 0.4 \times b$
	$= 0.248,\ \frac{31}{125}$	**A1**	CAO
		2	
1(ii)	**Method 1**		
	$\text{P(GS\|Not Red socks)} = \frac{0.4 \times 0.68}{1 - \textit{(i)}}$	**B1**	Correct [unsimplified] numerator seen in fraction
		M1	1 – their **(i)** as denominator in fraction
	$= 0.362,\ \frac{17}{47}$	**A1**	
	Method 2		
	$\text{P(GS\|Not Red socks)} = \frac{0.4 \times 0.68}{0.6 \times 0.8 + 0.4 \times 0.68}$	**B1**	Correct [unsimplified] numerator seen in fraction
		M1	Correct or (their **(i)**)' as denominator in fraction
	$= 0.362,\ \frac{17}{47}$	**A1**	
		3	

Question	Answer	Marks	Guidance
2(i)	$\sigma^2 = \frac{\Sigma(x-c)^2}{n} - \left(\frac{\Sigma(x-c)}{n}\right)^2$ $3.2^2 = \frac{3099.2}{40} - \left(\frac{\Sigma(x-c)}{40}\right)^2$	**M1**	Use correct formula with values substituted
	$\left(\frac{\Sigma(x-c)}{40}\right)^2 = 67.24$: $\Sigma(x-c) = 40 \times \sqrt{67.24}$	**M1**	Rearrange to make *their* $\left(\frac{\Sigma(x-c)}{40}\right)^2$ the subject, unsimplified.
	$= 328$	**A1**	Exact value, cao
		3	
2(ii)	$\Sigma x - 40c =$ *their* **(i)** Mean $= \frac{\textit{their}\ \textbf{(i)}}{40} + 50$ $= 58.2$	**B1FT**	FT *their* **(i)**
		1	

Question	Answer	Marks	Guidance
3(i)	$P(X< 132) = P\left(Z < \frac{132-140}{12}\right) = P(Z < -0.6667)$	**M1**	Using ± standardisation formula, no continuity correction, not σ^2 or $\sqrt{\sigma}$
	$= 1 - 0.7477$	**M1**	Appropriate area Φ from standardisation formula P(z<….) in final solution
	$= 0.252$ awrt	**A1**	Condone linear interpolation = 0.25243
		3	
3(ii)	P(time>k) = 0.675, $z = -0.454$	**B1**	±0.454 seen
	$\frac{k-140}{12} = -0.454$	**M1**	An equation using the standardisation formula with a z-value (not $1 - z$), condone σ^2 or $\sqrt{\sigma}$
	$k = 135, 134.6, 134.55$	**A1**	B0M1A1 max from –0.45
		3	

Question	Answer	Marks	Guidance
4(i)	<table><tr><td>x</td><td>−1</td><td>1</td><td>2</td><td>3</td></tr><tr><td>p</td><td>k</td><td>k</td><td>$4k$</td><td>$9k$</td></tr></table>	**B1**	Probability distribution table with correct values of x, no additional values unless with probability 0 stated, at least one correct probability including k
	$15k = 1$,	**M1**	Equating $\Sigma p = 1$, may be implied by answer
	$k = \frac{1}{15}$	**A1**	If 0 scored, SCB2 for probability distribution table with correct numerical probabilities.
		3	

Question	Answer	Marks	Guidance
4(ii)	**Method 1**		
	$\mathrm{E}(X) = 8k + 27k = 35k = \frac{35}{15} = \frac{7}{3}$	**B1FT**	FT if 0< *their k*<1
	$\mathrm{Var}(X) = \left(k + k + 16k + 81k\right) - \left(35k\right)^2$	**M1**	Correct formula for variance, in terms of k at least – must have '– mean^2'(ft).
	$= 1.16$, $\frac{52}{45}$	**A1**	
	Method 2		
	$\mathrm{E}(X) = \frac{8}{15} + \frac{27}{15} = \frac{35}{15} = \frac{7}{3}$	**B1FT**	FT if 0< *their k*<1
	$\mathrm{Var}(X) = \frac{1}{15} + \frac{1}{15} + \frac{16}{15} + \frac{81}{15} - \left(\frac{7}{3}\right)^2$	**M1**	Subst *their* values in correct var formula – must have '– mean^2'(ft) (condone probs not summing to exactly 1)
	= 1.16 (= 52/45)	**A1**	Using their values from **(i)**
		3	

Question	Answer	Marks	Guidance
5(i)	Dolphins | Sharks 5 | 9 9 5 5 3 2 | 6 | 4 6 8 5 3 2 | 7 | 0 1 2 4 7 2 2 0 | 8 | 0 4 Key: 3|6|4 means 63 kg for Dolphins and 64 kg for Sharks	**B1** **B1** **B1** **B1FT**	Correct stem can be upside down, ignore extra values, Correct Dolphin must be on LHS, Correct Sharks on either LHS or RHS of back-to-back. Alignment ± half a space, no late entries squeezed in, no crossing out if shape is changed. Condone a separate RHS stem-and-leaf diagram Correct single key for *their* single diagram, need both teams identified and 'kg' stated at least once here or in leaf headings or title.
		4	
5(ii)	Median = 72 LQ = 65, UQ = 80,	**B1**	72<UQ<82 – 62<LQ<72
	IQR = 80 – 65	**M1**	nfww
	= 15	**A1**	SCB1 if M0 scored for LQ = 65 **and** UQ = 80
		3	

Question	Answer	Marks	Guidance
6(i)	$P(4, 5, 6) = {}^6C_4\,0.35^4 0.65^2 + {}^6C_5\,0.35^5 0.65^1 + 0.35^6$	**M1**	Binomial term of form ${}^6C_x p^x (1-p)^{6-x}$ $0 < p < 1$ any p, $x \neq 6,0$
		A1	Correct unsimplified answer
	$= 0.117$	**A1**	
		3	
6(ii)	$1 - 0.65^n > 0.95$ $0.65^n < 0.05$	**M1**	Equation or inequality involving '0.65^n or 0.35^n' and '0.95 or 0.05'
	$n > \dfrac{\log 0.05}{\log 0.65} = 6.95$	**M1**	Attempt to solve *their* exponential equation using logs or Trial and Error.
	$n = 7$	**A1**	CAO
		3	
6(iii)	Mean = $0.35 \times 100 = 35$ Variance = $0.35 \times 0.65 \times 100 = 22.75$	**B1**	Correct unsimplified *np* and *npq,*
	$P\left(z > \dfrac{39.5 - 35}{\sqrt{22.75}}\right) = P(z > 0.943)$	**M1**	Substituting *their* μ and σ (condone σ^2) into the ±Standardisation Formula with a numerical value for *'39.5'*.
		M1	Using continuity correction 39.5 or 40.5
	$= 1 - 0.8272$	**M1**	Appropriate area Φ from standardisation formula P(z>….) in final solution, (>0.5 if z is -ve, <0.5 if z is +ve)
	$= 0.173$	**A1**	Final answer
		5	

Question	Answer	Marks	Guidance
7(i)	$\frac{9!}{2!3!}$	**M1**	9! alone on numerator, 2! and/or 3! on denominator
	= 30240	**A1**	Exact value, final answer
		2	
7(ii)	A ^ ^ ^ A ^ ^ ^ A Arrangements = $\frac{6!}{2!} = 360$	**B1**	Final answer
		1	
7(iii)	M ^ M ^ ^ ^ ^ ^ ^ = $\frac{7!}{3!} \times 7$	**M1**	7! in numerator, (considering letters not M)
		M1	Division by 3! only (removing repeated As)
		M1	Multiply by 7 (positions of M-M)
	= 5880	**A1**	Exact value, final answer
	Method 2 (choosing letter between Ms)		
	$1 \times \frac{6!}{2!} \times 7 + 4 \times \frac{6!}{3!} \times 7$	**M1**	6! in sum of 2 expressions $a6! + b6!$
		M1	Multiply by 7 in both expressions (positions of M-M)
	= 2520 + 3360	**M1**	$\frac{c}{2!} + \frac{d}{3!}$ seen (removing repeated As)
	= 5880	**A1**	Exact value

Question	Answer	Marks	Guidance
7(iii)	**Method 3**		
	(MAM) ^ ^ ^ ^ ^ ^ = 7!/2! = 2520	**M1**	7! in numerator (considering 6 letters + block)
	(MA'M) ^ ^ ^ ^ ^ ^ = 7!/3! × 4 = 840 × 4 = 3360	**M1**	Division by 2! and 3! seen in different terms
	Total = 2520 + 3360	**M1**	Summing 5 correct scenarios only
	= 5880	**A1**	Exact value
		4	
7(iv)	M A ^ = $^4C_1$ = 4	**B1**	Final answer
		1	
7(v)	M ^ ^ : $^4C_2$ = 6 M M ^ : $^4C_1$ = 4	**M1**	Either option M M ^ or M ^ ^ correct, accept unsimplified
	M M A : = 1 M A A : = 1 (M A _ : $^4C_1$ = 4)	**M1**	Add 4 or 5 correct scenarios only
	Total = 16	**A1**	Value must be clearly stated
	Method 2		
	M M ^ = $^5C_1$ = 5	**M1**	Either option M M ^ or M ^ ^ correct, accept unsimplified
	M ^ ^ = $^5C_2$ = 10	**M1**	Adding 2 or 3 correct scenarios only
	M A A = = 1 Total = 16	**A1**	Value must be clearly stated
		3	