Question	Answer	Marks	Guidance
1(i)	Poisson with $\lambda = 0.2$	B1	
	$1-e^{-0.2}(1 + 0.2 + \frac{0.2^2}{2})$	M1	1 – Poisson P(0, 1, 2, 3) attempted, any λ, allow one end error
	= 0.00115 (3 sf)	A1	SR: using Bin, ans 0.00115: **B1**
	Total:	**3**	
1(ii)	*n* large (n > 50)	B1	
	$np = 0.2 < 5$ or *p* small	B1	
	Total:	**2**	
2	Assume sd still = 3.8	B1	or sd unchanged
	H_0: $\mu = 64.0$ H_1: $\mu < 64.0$	B1	
	$\frac{63.3-64.0}{\frac{3.8}{\sqrt{100}}}$	M1	Standardising with their values (no sd / var mixes) Must have √100
	= –1.842	A1	
	comp "1.842" with *z*-value "1.842" < 1.96	M1	comp +ve with +ve or –ve with –ve or comp Φ ("1.842") with 0.975 0.9672 < 0.975 OE
	No evidence that heights are shorter	A1FT	OE FT their z_{calc}
	Total:	**6**	

Question	Answer	Marks	Guidance
3(a)	$7.1 \pm z \times \sqrt{\frac{2.6}{75}}$	M1	Expression of correct form must be z (note MR var = 2.6^2 can score **M1**) seen
	$z = 1.751$	B1	
	6.77 to 7.43 (3 sfs)	A1	Must be an interval
	Total:	3	
3(b)	0.04^3	M1	Allow 0.08^3 for **M1**
	$= 0.000064$	A1	
	Total:	2	
3(c)	e.g. Particular day or time of day	B1	Allow "Not random"
	Total:	1	
4(i)	Greater area where $x < 7.5$ than $x > 7.5$	B1	Allow Graph higher for $x < 7.5$ than for $x > 7.5$ or Graph decreasing or equiv expl'n
	Total:	1	
4(ii)	$\int_5^{10} \frac{k}{x^2} \mathrm{d}x = 1$	M1	Attempt Integ f(x) = 1 ignore limits
	$k\left[-\frac{1}{x}\right]_5^{10} = 1$ $k \times \frac{1}{10} = 1$	A1	Correct integration and limits
	$k = 10$ AG	A1	No errors seen
	Total:	3	

Question	Answer	Marks	Guidance
4(iii)	$10\int_5^{10} \frac{1}{x}\, dx$	**M1**	Attempt Integ $xf(x)$ ignore limits
	$= 10[\ln x]_5^{10}$ $= 10(\ln 10 - \ln 5)$	**M1**	Correct integration and limits
	= 10ln2 or 6.93 (3 sf)	**A1**	OE
	Total:	**3**	
4(iv)	$10\int_5^{10} 1\, dx - "6.93"^2$	**M1**	Attempt (Integ $x^2f(x)$) – $(E(x))^2$. No limits **M0**
	= 1.95 (accept 1.96)	**A1**	*Use of 6.93 gives 1.97* **A0**
	Total:	**2**	
5(i)	$W \sim N(6210, 171.88)$	**B2**	seen or implied. **B1** each parameter
	$\frac{6200 - "6210"}{\sqrt{"171.88"}}$ (= – 0.763)	**M1**	Standardising with their values. No sd / var mix
	1 – Φ("0.763")	**M1**	For area consistent with their mean
	= 0.223 (3 sfs)	**A1**	
	Total:	**5**	

Question	Answer	Marks	Guidance
5(ii)	E(C – 2B) = −50	M1	"6210"–2(3130) (or E(2B–C)=50
	Var(C – 2B) = "171.88" + $2^2 \times 12.1^2$ (= 757.52)	M1	
	$\frac{0-(-50)}{\sqrt{"757.52"}}$ (= 1.817)	M1	Standardising with their values
	Φ("1.817")	M1	For area consistent with their mean
	= 0.965 (3 sfs)	A1	
	Total:	**5**	
6(i)	mean = 6.6	B1	**B1** for 6.6 (could be scored in iii)
	$P(X \leqslant 1) = e^{-6.6}(1 + 6.6) = 0.0103$	M1	Allow incorrect λ in both probs
	$P(X \leqslant 2) = e^{-6.6}(1 + 6.6 + \frac{6.6^2}{2}) = 0.0400$	M1A1	**A1** for both values
	CR is $X \leqslant 1$	DA1	Dep on at least one **M**
	P(Type I error) = $P(X \leqslant 1) = 0.0103$	B1FT	FT their $P(X \leqslant 1)$
	Total:	**6**	
6(ii)	Wrongly concluding that (mean) no of (sports) injuries has decreased	B1	Must be in context
	Total:	**1**	

Question	Answer	Marks	Guidance
6(iii)	H_0: $\lambda = 6.6$ H_1: $\lambda < 6.6$	**B1**	Can be scored in (i). Allow μ or λ / 1.1 or 6.6 or $P(X \leqslant 2) = 0.0400 > 0.02$
	2 not in CR	**M1**	
	No evidence mean no. of injuries has decreased	**A1FT**	
	Total:	**3**	
6(iv)	N(39.6, 39.6)	**B1**	May be implied
	$\frac{29.5-39.6}{\sqrt{39.6}}$ (= −1.605)	**M1**	Allow with wrong or no cc
	Φ("–1.605") = 1 – Φ("1.605")	**M1**	For area consistent with their mean
	= 0.0543 (3 sfs)	**A1**	
	Total:	**4**	