Question	Answer	Marks	Guidance
1	est(μ) (= 153.2 ÷ 75) = 2.04 (3 sf)	**B1**	
	est(σ^2) = $\frac{75}{74}\left(\frac{340.24}{75} - \text{"}2.04267\text{"}^2\right)$ oe	**M1**	
	= 0.369 (3 sf)	**A1**	Accept 0.368
		3	

Question	Answer	Marks	Guidance
2(i)	$\frac{20}{100} \pm z \times \sqrt{\frac{0.2\times(1-0.2)}{100}}$	**M1**	Any z
	z = 1.881 or 1.882	**B1**	
	= 0.125 to 0.275	**A1**	
		3	
2(ii)	$\frac{1}{6}$ is within this range No evidence of bias concerning 2	**B1ft**	Both statements needed
		1	

Question	Answer	Marks	Guidance
3	N(153, 153)	**B1**	Seen or implied
	$\frac{139.5-153}{\sqrt{\text{"}153\text{"}}}$ (= –1.091)	**M1**	Allow with wrong or no cc
	ϕ("–1.091") = 1 – ϕ("1.091")	**M1**	For area consistent with their working
	= 0.138 (3 sf)	**A1**	
		4	

Question	Answer	Marks	Guidance
4(i)	mean= 155.1	**B1**	
	var = $1.5^2 \times 10.2$ (= 22.95) sd = √"22.95"	**M1**	or 1.5 × √10.2
	= 4.79	**A1**	
		3	

Question	Answer	Marks	Guidance
4(ii)	mean = 103.4 + "155.1" (= 258.5) var = 10.2 + "22.95" (=33.15)	B1ft	Both. ft their 155.1 and 22.95. Accept sd.
	$\frac{250-"258.5"}{\sqrt{"33.15"}}$ (= –1.476)	M1	Standardising – no sd/var mix. Their mean/sd must be from an attempt at combination
	1– ϕ(–1.476) = ϕ(1.476)	M1	For area consistent with their working
	= 0.930 (3 sf)	A1	Allow 0.93
		4	

Question	Answer	Marks	Guidance
5(i)	$\frac{14-14.2}{\frac{3.1}{\sqrt{50}}}$ (= – 0.456)	M1	For stand'n; must have √50
	1 – Φ("0.456")	M1	for area consistent with their working
	= 0.324 (3 sfs)	A1	
		3	
5(ii)	No because *n* large	B1	Accept n > 30
		1	
5(iii)	H_0: $\mu = 14.2$ H_1: $\mu < 14.2$	B1	or 'pop mean', but not just 'mean'
	$\frac{13.5-14.2}{\frac{3.1}{\sqrt{100}}}$	M1	For stand'n; must have √100
	= –2.258	A1	
	comp –2.054 (or –2.055)	M1	Valid comparison of z values or areas (0.0119 < 0.02)
	There is evidence (at 2% level) that mean mass in this area < 14.2	A1ft	Ft their z. Correct conclusion no contradictions
		5	

Question	Answer	Marks	Guidance
6(i)	$\int_5^{10} \frac{k}{x^2}\,dx = 1$	**M1**	Attempt integration f(*x*) and '= 1'; ignore limits
	$\left[-\frac{k}{x}\right]_5^{10} = 1$ oe $(\frac{k}{5} - \frac{k}{10} = 1)$	**A1**	Correct integration and limits and '= 1'
	$k = 10$ **AG**	**A1**	No errors seen
		3	
6(ii)	$10\int_5^{10} \frac{1}{x}\,dx$ $10[\ln x]_5^{10}$	**M1**	Attempt integ *x*f(*x*); ignore limits. or 10(ln 10 – ln 5)
	= 10ln 2 **AG**	**A1**	No errors seen
		2	
6(iii)	$10\int_9^{10} \frac{1}{x^2}\,dx$ $(10\left[-\frac{1}{x}\right]_9^{10})$	**M1**	Attempt integ f(x) with correct limits
	$10\left[-\frac{1}{10} + \frac{1}{9}\right]$	**A1**	Substitute correct limits in correct integration
	$= \frac{1}{9}$ or 0.111 (3 sf)	**A1**	
		3	
6(iv)	$\int_5^{a} \frac{k}{x^2}\,dx = 0.6$ $10\left[-\frac{1}{x}\right]_5^{a} = 0.6$	**M1**	Attempt integration of f(*x*) with correct limits and = 0.6
	$10[\frac{1}{5} - \frac{1}{a}] = 0.6$	**A1**	Substitute correct limits in correct integration
	$a = \frac{50}{7}$ or 7.14 (3 sf)	**A1**	
		3	

Question	Answer	Marks	Guidance
7(i)	Po(1.0)	**B1**	Seen or implied
	$e^{-1}(1 + 1 + \frac{1^2}{2})$	**M1**	Allow any λ. Allow one end error.
	= 0.920 (3 sfs)	**A1**	
		3	
7(ii)	$P(X > 3) = 1 - e^{-1.5}(1+1.5+ \frac{1.5^2}{2} + \frac{1.5^3}{3!})$	**M1**	Allow any λ. Allow one end error
	= 0.0656	**A1**	
		2	
7(iii)(a)	Incorrectly concluding that more absences than usual when there are not oe	**B1**	In context
		1	
7(iii)(b)	H_0: $\lambda = 1.5$ (or 0.3) H_1: $\lambda > 1.5$ (or 0.3)	**B1**	Or μ Both
	$P(X > 4) =$ "0.0656" $- e^{-1.5} \times \frac{1.5^4}{4!}$ = 0.0186 (3 sf)	**M1**	or $1 - e^{-1.5}(1+1.5+ \frac{1.5^2}{2} + \frac{1.5^3}{3!} + \frac{1.5^4}{4!})$
	P(Type I) = 0.0186 or 0.0185	**A1ft**	Ft their $P(X > 4)$ if less than 0.05
		3	
7(iii)(c)	$P(X > 3) =$ "0.0656"	**B1ft**	Ft their **(ii)**
	0.0656 > 0.05	**M1**	
	No evidence of more than usual male absences	**A1ft**	Ft their P(X>3). Correct conclusion. No contradictions.
		3	