Question	Answer	Marks	Guidance
1	Var(Ps) = $\frac{0.3(1-0.3)}{120}$ (= 0.00175)	**M1**	Attempt correct values in correct formula
	$0.3 \pm z\sqrt{"0.00175"}$	**M1**	must be a z-value, not a prob
	z = 1.645	**B1**	
	CI = 0.231 to 0.369 (3 sf)	**A1**	
	Total:	**4**	

Question	Answer	Marks	Guidance
2(i)	(H_1): $\mu \neq 6.4$	**B1**	
	Total:	**1**	
2(ii)	comp 2.43 with a z-value z = 2.576 AND	**M1**	oe valid comparison
	No evidence that μ is not 6.4 or do not reject μ = 6.4	**A1**	Allow "Accept μ = 6.4" Must mention μ, not just "H_0" or "H_1"
	Total:	**2**	
2(iii)	Testing for an increase in μ, or for a decrease in μ, rather than a change	**B1**	Any equiv statement
	Total:	**1**	

Question	Answer	Marks	Guidance
3(i)	$\frac{53-52}{6.1\div\sqrt{75}}$ (= 1.420)	**M1**	
	$\frac{51-52}{6.1\div\sqrt{75}}$ (= –1.420)	**M1**	or –"1.420" seen
	Φ("1.420") – Φ("–1.420")	**M1**	
	= 0.844 (3 sfs)	**A1**	
	Total:	**4**	
3(ii)	Need to assume $\bar{X}$ (approx.) normally distributed	**B1**	or X not stated to be normally distributed
	Total:	**1**	

Question	Answer	Marks	Guidance
4(i)	($\lambda =$) 4.5	**B1**	
	$e^{-4.5}(1 + 4.5 + \frac{4.5^2}{2!})$	**M1**	Allow any λ. Allow one end error
	= 0.174	**A1**	
	Total:	**3**	
4(ii)	Accept reduction in mean no. of missed appts although untrue	**B1**	or Mean is 0.9 (or 4.5) but < 3 missed appts. In context
	Total:	**1**	
4(iii)	P($X \geqslant 3$)	**M1**	Attempted
	$= 1 - e^{-1}(1 + 1 + \frac{1^2}{2!})$	**M1**	Allow any λ except 4.5 or 0.9, Allow one end error
	= 0.0803 (3 sfs)	**A1**	
	Total:	**3**	

Question	Answer	Marks	Guidance
5(a)(i)	$k = 1$	**B1**	
	Total:	**1**	
5(a)(ii)	f_2: area > 1 (area ≠ 1)	**B1**	oe
	f_3: includes negative values of f_3	**B1**	oe
	Total:	**2**	
5(b)(i)	$6\int_{-a}^{a}(a^2 - x^2)\mathrm{d}x = 1$	**M1**	Integ f(x) = 1, ignore limits
	$6[a^2x - \frac{x^3}{3}]_{-a}^{a} = 1$	**A1**	Correct integral and limits
	$6(2a^3 - \frac{2a^3}{3}) = 1$ $\frac{24a^3}{3} = 1$ or $8a^3 = 1$ $a = 1/2$ **AG**	**A1**	Correctly obtained. No errors seen. (SR Verification scores M1A1 only max 2/3)
	Total:	**3**	

Question	Answer	Marks	Guidance
5(b)(ii)	0	**B1**	
	Total:	**1**	
5(b)(iii)	$6\int_{-0.5}^{0.5}(\frac{x^2}{4}-x^4)\mathrm{d}x$ $(=6\left[\frac{x^3}{12}-\frac{x^5}{5}\right]_{-0.5}^{0.5}=0.05)$ Var = $0.05 - 0^2$	**M1**	attempt int x^2f(x) & correct limits
	= 0.05 oe	**A1**	cao; allow omission of -0^2
	Total:	**2**	

Question	Answer	Marks	Guidance
6(i)	Assume cartons are random sample(s)	**B1**	or masses of cartons are independent of each other oe
	E(T) = 816.4 Var(T) = 1570.08	**B1**	Both
	$z = \frac{900-"816.4"}{\sqrt{"1570.08"}}$ (= 2.110)	**M1**	
	1 – Φ(“2.110”)	**M1**	
	= 0.0174 = 1.74% (3 sfs)	**A1**	% only (accept 1.7% if 0.0174 seen)
	Total:	**5**	
6(ii)	P($F - S > 0$) stated or implied	**M1**	P($S - F < 0$)
	62.0 – 78.8 (= –16.8) & $10.0^2 + 12.6^2$ (= 258.76)	**B1**	78.8 – 62.0 (= 16.8) & $12.6^2 + 10.0^2$ (= 258.76)
	$z = \frac{0-("-16.8")}{\sqrt{"258.76"}}$ (= 1.044)	**M1**	$z = \frac{0-"16.8"}{\sqrt{"258.76"}}$ (= –1.044)
	1 – Φ(“1.044”)	**M1**	Φ(“–1.044”) = 1 – Φ(“1.044”)
	(= 1 – 0.8517) = 0.148 (3 sfs)	**A1**	
	Total:	**5**	

Question	Answer	Marks	Guidance
7(i)	Planes arrive at constant mean rate	**B1**	
	Planes arrive at random	**B1**	or Planes arrive independently Must be in context
	Total:	**2**	
7(ii)(a)	($\lambda =$) $5.2 \div 4$	**M1**	
	$e^{-1.3}(\frac{1.3^2}{2} + \frac{1.3^3}{3!})$	**M1**	Allow any λ , allow one end error
	= 0.330 (3 sfs)	**A1**	Accept 0.33
	Total:	**3**	
7(ii)(b)	$1 - e^{-3.467} \times (1 + 3.467 + \frac{3.467^2}{2!} + \frac{3.467^3}{3!})$	**M1**	Allow any λ except 5.2 or 1.3, allow one end error
	= 0.456 (3 sfs)	**A1**	
	Total:	**2**	
7(iii)	N(52, 52) stated or implied	**B1**	
	$\frac{60.5-52}{\sqrt{52}}$ (= 1.179)	**M1**	ft their mean and var. Allow wrong or no cc or no √
	Φ(“1.179”)	**M1**	
	= 0.881 (3 sf)	**A1**	
	Total:	**4**	