Question	Answer	Marks
1	N(242.4, 162.24)	B1
	$\frac{220-'242.4'}{\sqrt{'162.24'}}$ (= –1.759)	M1
	ϕ ('–1.759) = 1 – ϕ ('1.759') = 0.0393	M1
	3.93%	A1
		4

Question	Answer	Marks
2(a)	H_0: Proportion = 0.05 H_1: Proportion > 0.05	B1
		1
2(b)	$1-(0.95^{25}+25\times0.95^{24}\times0.05+{}^{25}C_2\times0.95^{23}\times0.05^2+{}^{25}C_3\times0.95^{22}\times0.05^3)$	M1
	Completely correct expression	A1
	0.0341	A1
		3
2(c)	Type II	B1
	Will conclude proportion not increased	B1
		2

Question	Answer	Marks
3(a)(i)	B(3600, 0.0012)	**B1**
		1
3(a)(ii)	Po(4.32) (**B1** for Po. **B1** for $\lambda = 4.32$)	**B2**
	$n = 3600$ which is large, $p = 0.12$ which is small and $np = 4.32$ which is < 5	**B1**
		3
3(a)(iii)	$1 - e^{-4.32}\left(1 + 4.32 + \frac{4.32^2}{2}\right)$	**M1**
	0.805 (3 sf)	**A1**
		2
3(b)	$e^{-\lambda} > 0.1$	**M1**
	$(-\lambda > \ln 0.1)$ $(\lambda < \ln 10)$ $0.0012n < \ln 10$	**A1**
	$(n < 1918.8)$ largest n is 1918	**A1**
		3

Question	Answer	Marks
4(a)	$E(X) = 2$	**B1**
	$0.2 \times 1 + 0.4 \times 2^2 + 0.2 \times 3^2 + 0.1 \times 4^2 - 2^2$ (= 1.2) **AG**	**B1**
		2
4(b)	$\frac{a-2}{\sqrt{1.2 \div 200}} = \phi^{-1}(0.9)$ (**M1** for LHS, **M1** for RHS)	**M1** **M1**
	$a = 2 + \sqrt{1.2 \div 200} \times 1.282$	**M1**
	2.10 (3 sf)	**A1**
		4
4(c)	Yes, because X is not normally distributed.	**B1**
		1
4(d)	H_0: pop mean = 2 H_1: pop mean < 2	**B1**
	$\frac{1.86-2}{\sqrt{1.2 \div 200}}$	**M1**
	1.807	**A1**
	comp $z = 1.645$	**M1**
	There is evidence that the spinner is biased so that mean is less than 2	**A1**
		5

Question	Answer	Marks
5(a)(i)	0, 1, 2, 3, ...	**B1**
		1
5(a)(ii)	3	**B1**
		1
5(a)(iii)	$e^{-3}\left(\frac{3^4}{4!}+\frac{3^5}{5!}+\frac{3^6}{6!}\right)$	**M1**
	0.319 (3 sf)	**A1**
		2
5(b)	$\Phi^{-1}(0.0668)$ $(=-1.500)$	**M1**
	$N(\mu, \mu)$	**M1**
	$\frac{45.5-\mu}{\sqrt{\mu}}$ = "–1.500"	**M1**
	$\mu -$"1.500"$\sqrt{\mu - 45.5 = 0}$ $\sqrt{\mu} = \frac{"1.5" \pm \sqrt{("-1.5")^2 + 4\times 45.5}}{2} (= 7.5369)$	**M1**
	μ = 56.8 (3 sf)	**A1**
		5

Question	Answer	Marks
6(a)	$\int_1^a \frac{k}{x^2}\,dx = 1$	M1
	$k\left[-\frac{1}{x}\right]_1^a = 1$ $k\left[1-\frac{1}{a}\right] = 1$	A1
	$k\left[\frac{a-1}{a}\right] = 1$ $\left(k = \frac{1}{a-1}\right)$ **AG**	A1
		3
6(b)	$\frac{a}{a-1}\int_1^a \frac{1}{x}\,dx$	M1
	$\frac{a}{a-1}[\ln x]_1^a$	A1
	$\frac{a\ln a}{a-1}$	A1
		3

Question	Answer	Marks
6(c)	$\frac{a}{a-1}\int_1^m \frac{1}{x^2}\,\mathrm{d}x = \frac{3}{5}$	M1
	$\frac{a}{a-1}\left[-\frac{1}{x}\right]_1^m = \frac{3}{5}$ $\frac{a}{a-1}\left[1-\frac{1}{m}\right] = \frac{3}{5}$	A1
	$\frac{1}{m} = 1-\frac{3(a-1)}{5a}$ or $\frac{1}{m} = \frac{2a+3}{5a}$	A1
	$m = \frac{5a}{2a+3}$	A1
		4