Hypothesis tests for a Poisson mean

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** H0: $\lambda = 4$, H1: $\lambda > 4$, one-tailed **b)** H0: $\lambda = 0.8$, H1: $\lambda < 0.8$, one-tailed **c)** H0: $\lambda = 24$, H1: $\lambda \neq 24$, two-tailed	3
2	H0: $\lambda = 3$, H1: $\lambda > 3$; $P(X \geq 7) = 0.0335 < 0.05$, so reject H0: there is evidence that the mean rate of red kite sightings has increased.	4
3	H0: $\lambda = 8$, H1: $\lambda < 8$ (for 2 days); $P(X \leq 3) = 0.0424 < 0.05$, so reject H0: there is evidence that the rate of faults has decreased.	5
4	**a)** H0: $\lambda = 5$, H1: $\lambda > 5$ **b)** $X \geq 10$ **c)** 0.0318	5
5	**a)** $X \leq 1$ or $X \geq 12$; tail probabilities 0.0174 and 0.0201 **b)** 0.0374 **c)** 2 is not in the critical region, so do not reject H0: insufficient evidence that the mean number of accidents has changed	6
6	H0: $\lambda = 12.5$, H1: λ 0.05, so do not reject H0: insufficient evidence that the new cable has fewer faults.	5
7	**a)** H0: $\lambda = 9$, H1: $\lambda \neq 9$; $P(X \geq 16) = 0.0220 < 0.025$, reject H0: evidence that the mean number of bikes sold per week has changed **b)** Not the same: $0.0220 > 0.005$, so at 1% there is insufficient evidence of a change	6
8	**a)** 2 **b)** 0.0028 **c)** 3 is not in the critical region: insufficient evidence at the 1% level that the mean number of admissions has fallen	6
9	**a)** $X \geq 11$ **b)** 10 is not in the critical region: insufficient evidence that the rate of late returns has increased **c)** 0.0651	8
10	**a)** $X \sim B(200, 0.02)$: n is large and p is small, so $X \approx Po(200 \times 0.02) = Po(4)$ **b)** H0: $p = 0.02$, H1: $p > 0.02$; $P(X \geq 9) = 0.0214 < 0.05$, reject H0: evidence that the proportion of faulty bulbs is more than 2%	7
11	**a)** Po(6) **b)** H0: $\lambda = 6$, H1: $\lambda < 6$; $P(X \leq 1) = 0.0174 < 0.05$, reject H0: evidence that the mean number of breakdowns has decreased **c)** $X \leq 1$; actual significance level 0.0174	8
12	**a)** The smallest possible count is 0, and $P(X = 0) = e^{(-2.5)} = 0.0821 > 0.05$, so no result is significant **b)** 2 **c)** $X \leq 1$; actual significance level 0.0404	9

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	d) 2 is not in the critical region: insufficient evidence that the mean rate of boats has fallen	

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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