

Solutions

2.1 Rejecting H_0 : the sample provides sufficient evidence (at that level) that the parameter has changed as H_1 claims. Not rejecting: insufficient evidence – not proof that H_0 is true.

2.2 $P(X \geq 20) = 0.0494 < 0.05$ and $P(X \geq 19) = 0.1002 > 0.05$, so the critical region is $X \geq 20$.

2.3 $0.0494 = 4.94\%$.

3.1 (a) $X \sim \text{Po}(10)$ (20 per hour $\rightarrow$ 10 per half hour). (b) Customers enter singly (independently) at a constant average rate. (c) $H_0: \lambda = 10$, $H_1: \lambda \neq 10$ (equivalently 20 vs $\neq$ 20 per hour). (d) Lower tail: $P(X \leq 3) = 0.0103$, $P(X \leq 4) = 0.0293 > 0.015$ – stop at 3. Upper tail: $P(X \geq 17) = 0.0270 > 0.015$, $P(X \geq 18) = 0.0143$ – stop at 18. Critical region: $X \leq 3$ or $X \geq 18$. (e) $0.0103 + 0.0143 = 0.0246 = 2.46\%$. (f) 16 lies outside the critical region: do not reject H_0 – insufficient evidence that the rate of customers entering has changed.

3.2 $H_0: p = 0.3$, $H_1: p > 0.3$; under H_0 , $X \sim B(25, 0.3)$. $P(X \geq 11) = 1 - P(X \leq 10) = 1 - 0.9022 = 0.0978 < 0.10$, so 11 lies in the critical region ($X \geq 11$): reject H_0 – there is evidence, at the 10% level, that the proportion of customers buying insurance has increased.

Local review guidance: hypotheses with the parameter named in symbols and words; tail accumulation on the correct side(s); actual level as the sum of exactly the tails used; conclusions in context, “insufficient evidence” when outside. This is authored classroom guidance.