

Answer on Question #75761, Math / Statistics and Probability

Records show that the probability is 0.00006 that a car will have a flat tire while driving through a certain tunnel. Find the probability that at least 2 of 10,000 cars passing through this tunnel will have flat tires.

Solution

The Poisson distribution

If the quantity  $n$  is large and  $p$  is small, then

$$f(x) = e^{-np} \frac{(np)^x}{x!}, \text{ for } x = 0, 1, 2, 3, \dots$$

First, calculate the mean:

$$\mu = np = 10000 \cdot 0.00006 = 0.6$$

Then

$$\begin{aligned} P(X \geq 2) &= 1 - P(X \leq 1) = 1 - (P(0) + P(1)) = \\ &= 1 - \left( e^{-0.6} \frac{(0.6)^0}{0!} + e^{-0.6} \frac{(0.6)^1}{1!} \right) = 1 - 1.6e^{-0.6} \approx 0.1219 \end{aligned}$$

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