

## Answer on Question #82001 – Math – Statistics and Probability

### Question

It is stated that 2 percent razor blades are defective out of 2000 random sample unit

1. 3 or more defective.
2. 4 or less defective

### Solution

The Poisson distribution

$$P(X = x) = e^{-\lambda} \frac{\lambda^x}{x!}$$

$$\mu = \lambda = np = 2000(0.02) = 40$$

$$\begin{aligned} 1. P(X \geq 3) &= 1 - (P(X = 0) + P(X = 1) + P(X = 2)) = \\ &= 1 - \left( e^{-40} \frac{40^0}{0!} + e^{-40} \frac{40^1}{1!} + e^{-40} \frac{40^2}{2!} \right) = 1 - e^{-40} (1 + 40 + 800) = \\ &= 1 - 841e^{-40} \approx 1. \end{aligned}$$

$$\begin{aligned} 2. P(X \leq 4) &= P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3) + P(X = 4) = \\ &= e^{-40} \frac{40^0}{0!} + e^{-40} \frac{40^1}{1!} + e^{-40} \frac{40^2}{2!} + e^{-40} \frac{40^3}{3!} + e^{-40} \frac{40^4}{4!} = \\ &= e^{-40} \left( 1 + 40 + 800 + \frac{32000}{3} + \frac{320000}{3} \right) = \frac{354523}{3} e^{-40} \approx 0. \end{aligned}$$

**Answer:**

1.  $1 - 841e^{-40}$ ;
2.  $\frac{354523}{3} e^{-40}$ .