

## Answer on Question #85447 – Math – Statistics and Probability

### Question

d) In 500 independent calculations, a student made 25 errors. His instructor randomly checked seven calculations of the student. Find the probability that instructor detects

- i) Exactly 2 errors
- ii) At most two errors

### Solution

Assume a Poisson distribution

$$P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}, x = 0, 1, 2, \dots$$

Let  $X$  denote the number of errors in 500 independent calculations. Then, we have

$$\lambda = 25 \cdot \frac{7}{500} = 0.35$$

- i) Exactly 2 errors

$$P(X = 2) = \frac{0.35^2 e^{-0.35}}{2!} \approx 0.043162$$

- ii) At most two errors

$$\begin{aligned} P(X \leq 2) &= P(X = 0) + P(X = 1) + P(X = 2) = \\ &= \frac{0.35^0 e^{-0.35}}{0!} + \frac{0.35^1 e^{-0.35}}{1!} + \frac{0.35^2 e^{-0.35}}{2!} = e^{-0.35} \left( 1 + 0.35 + \frac{0.35^2}{2} \right) \approx \\ &\approx 0.994491 \end{aligned}$$