Answer on Question #85414 – Math – Statistics and Probability

Question

b) A typical sheet of metal has on the average 2 defects per 5 m^2.
What is the probability that a 10 m^2sheet of metal will have at least 3 defects?

Solution

Assume a Poisson distribution

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

Let X denote the number of defects in 10 m^2sheet of metal. Then, since the unit area is 5m^2sheet of metal, we have

$$\lambda = 2 \cdot \frac{10}{5} = 4$$

$$P(X \geq 3) = 1 - \big(P(X = 0) + P(X = 1) + P(X = 2)\big) =$$

$$= 1 - \left(\frac{4^0 e^{-4}}{0!} + \frac{4^1 e^{-4}}{1!} + \frac{4^2 e^{-4}}{2!}\right) = 1 - 13e^{-4} \approx 0.7619.$$