

Answer on Question #62213 – Math – Statistics and Probability

Question

A metal sheet has, on the average, 5 defects per 1.0 m². Assuming a Poisson distribution, calculate the probability that a 1.5 m² piece of the metal sheet will have at least 4 defects.

Solution

Let X denote the number of defects in a 1.5-square-foot sheet of the metal.

Since the unit area is 1.0-square-feet, then

$$\lambda = 5 \cdot 1.5 = 7.5$$

The probability that a 1.5 m² piece of the metal sheet will have at least 4 defects is

$$\begin{aligned} P(X \geq 4) &= 1 - P(X \leq 3) = 1 - (P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3)) = \\ &= 1 - e^{-7.5} \left(\frac{7.5^0}{0!} + \frac{7.5^1}{1!} + \frac{7.5^2}{2!} + \frac{7.5^3}{3!} \right) = 0.9409. \end{aligned}$$

Answer: 0.9409.