Answer on Question#38788 – Math - Probability

In a factory turning out razor blade, there is a small chance of 1/500 for any blade to be defective. The blades are supplied in a packet of 10. Use Poisson distribution to calculate the approximate number of packets containing blades with no defective, one defective, two defectives and three defectives in a consignment of 10,000 packets.

Solution:

The probability of a defect per blade is $p = \frac{1}{500} = 0.002$.

Poisson distribution:

$$P_\lambda(k) = \frac{\lambda^k}{k!} e^{-\lambda}$$

Where k equals to number of defective blades in a packet and for a packet of 10, the mean number of defects $\lambda = 10p = 0.02$.

$k = 0$

$$P_\lambda(0) = \frac{0.02^0}{0!} e^{-0.02} = 0.980199$$

So the approximate number of packets containing blades with no defective is $10000 \times 0.980199 = \mathbf{9802}$

$k = 1$

$$P_\lambda(1) = \frac{0.02^1}{1!} e^{-0.02} = 0.019604$$

So the approximate number of packets containing blades with one defective is $10000 \times 0.0196 = \mathbf{196}$

$k = 2$

$$P_\lambda(2) = \frac{0.02^2}{2!} e^{-0.02} = 0.000196$$

So the approximate number of packets containing blades with two defectives is $10000 \times 0.000196 = \mathbf{2}$

$k = 3$

$$P_\lambda(3) = \frac{0.02^3}{3!} e^{-0.02} = 0.000013$$

So the approximate number of packets containing blades with no defective is $10000 \times 0.000013 = \mathbf{0}$

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