Answer on question 38897 – Math – Differential Calculus

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 = 1/500 = 0.002. This means that for a packet of 10, the mean number of defects L = 10p = 0.02. The parameter L is used in the Poisson distribution to give the probability of the number of defects, n, in a packet of 10:

$$P(n) = \frac{L^n}{n!}e^{-L}$$

Therefore,

$$P(0) = \frac{0.02^0}{0!}e^{-0.02} \approx 0.98;$$

The approximate number of packets containing blades with no defective blades is $P(0) * 10000 \approx 9800$

$$P(1) = \frac{0.02^1}{1!}e^{-0.02} \approx 0.0196;$$

The approximate number of packets containing blades with one defective blade is $P(1) * 10000 \approx 196$

$$P(2) = \frac{0.02^2}{2!}e^{-0.02} \approx 0.000196;$$

The approximate number of packets containing blades with two defective blades is $P(2) * 10000 \approx 2$

$$P(3) = \frac{0.02^3}{3!}e^{-0.02} \approx 0.0000013;$$

The approximate number of packets containing blades with three defective blades is $P(3) * 10000 \approx 0$

Answer: 9800; 196; 2; 0.