Question

Cancer patients arrive at an oncology centre at an average rate of 5 patients per hour. Assuming a Poisson distribution, determine the probability that:

1. at least 2 cancer patients arrive in a given hour.

Solution

We have that $\lambda = 5$. The probability function is

$$P(x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

The probability that at least 2 cancer patients arrive in a given hour is

$$P(X \geq 2) = 1 - \left(P(0) + P(1)\right) = 1 - \frac{e^{-5}5^0}{0!} - \frac{e^{-5}5^1}{1!} = 1 - 6e^{-5} \approx$$
$$\approx 0.959572318$$

Question

2. 4 cancer patients arrive in a given half-hour period.

Solution

We have that $\lambda = 5(1/2) = 5/2$. The probability function is

$$P(x) = \frac{e^{-\lambda}\lambda^x}{x!}$$

The probability that 4 cancer patients arrive in a given half-hour period is

$$P(4) = \frac{e^{-5/2}\left(\frac{5}{2}\right)^4}{4!} = \frac{625e^{-5/2}}{384} \approx 0.133601885$$