You may use the table of the Poisson distribution in your textbook.

\[ p(x) = \frac{e^{-\lambda} \lambda^x}{x!}, x = 0, 1, 2, \ldots \]

1. The number of requests for assistance received by a towing service is a Poisson process with rate \( \alpha = 4 \) per hour. Compute the probability that exactly ten requests are received during a particular two hour period.

Using \( \lambda = 8 \)

\[ p(10) = \frac{e^{-8} \cdot 8^{10}}{10!} = .0993 \]

using the table find

\[ P(X \leq 10) - P(X \leq 9) = .816 - .717 = .099 \]

Calculator

Poisson pdf (8,10)=.09926

2. An article reports that 1 in 200 people carry the gene that causes inherited colon cancer. Consider a sample of 1000 individuals. Using the Poisson approximation to the binomial distribution approximate the probability that between 5 and 8 individuals inclusive carry the gene.

\[ \lambda = \frac{1}{200} (1000) = 5 \]

\[ P(5 \leq X \leq 8) = \frac{5^5 e^{-5}}{5!} + \frac{5^6 e^{-5}}{6!} + \frac{5^7 e^{-5}}{7!} + \frac{5^8 e^{-5}}{8!} = .4914 \]

Using table \( P(X \leq 8) - P(X \leq 4) = .932 - .440 = .492 \)

Using Calculator

Poisson cdf(5,8)-Poissoncdf(4,8) = .4914

The exact answer using the binomial distribution

\[
\sum_{x=5}^{8} \frac{1000!}{x! (1000 - x)!} \cdot (.005)^x \cdot (.995)^{1000-x}
\]

\[ \text{Out}[2] = 0.492344 \]