Stat 345 Solutions - Section 4.9 (2^{nd} ed.)/3.9 (3^{rd} ed.)

Problem 4-84/3-97

We assume that $X \sim Poisson(\lambda = 4)$.

(a) $P(X = 0) = \frac{e^{-4}4^0}{0!} = 0.0183$

(b)

$$\begin{aligned} P(X \leq 2) &= P(X = 0) + P(X = 1) + P(X = 2) \\ &= 0.0183 + \frac{e^{-4}4^1}{1!} + \frac{e^{-4}4^2}{2!} \\ &= 0.0183 + 0.0733 + 0.1465 \\ &= 0.2381 \end{aligned}$$

(c) $P(X = 4) = \frac{e^{-4}4^4}{4!} = 0.195$
(d) $P(X = 8) = \frac{e^{-4}4^8}{8!} = 0.0298$

Problem 4-86/3-99

$$\begin{aligned} P(X = 0) &= \frac{e^{-\lambda}\lambda^0}{0!} \\ &= e^{-\lambda} \end{aligned}$$

Thus, $e^{-\lambda} = 0.05$ and $\lambda = 2.995$. The mean and variance are thus 2.995.

Problem 4-88/3-101

(a) Let X be the number of flaws in one square meter. Then $X \sim Poisson(\lambda = 0.1)$. Then $P(X = 2) = e^{-0.1}0.1^2/2! = 0.0045$.

(b) let Y be the number of flaws in 10 square meters. Then $Y \sim Poisson(\lambda = 1)$. Then $P(Y = 1) = e^{-1}1^1/1! = 0.3679$.

(c) Let Z be the number of flaws in 20 square meters. Then $Z \sim Poisson(\lambda = 2)$. Then $P(Z = 0) = e^{-2}2^0/0! = 0.1353$.

(d) $P(Y \geq 2) = 1 - P(Y < 2) = 1 - [P(Y = 0) + P(Y = 1)] = 1 - [e^{-1} + 0.3679] = 0.2642$.