Chapter 7. #5 (P248)

→ Firehouse problem. P231

a.) 2050 Emergency calls in a one-year period.
Estimate rate (λ) of house fires / month

$2050 = X \sim Pois(\lambda \cdot 12) \quad t = \#\text{month} = 12$

$2050 = X \sim Pois(\lambda_{12})$

$E[X] = \text{mean}[X]; \ \text{mean}(Pois) = \lambda$, therefore $\frac{2050}{12} = \lambda$

$\lambda = 170.83$.

b.) $V(x) = \int (x - E[x])^2 \cdot f(x)\, dx$

$= \int (x - 171)^2 \cdot 171 e^{-171x}\, dx =$

c.) $P(X$

D.) $\frac{n}{171} - \frac{2\sqrt{n}}{171} \leq X_1, \ldots X_n \leq \frac{n}{171} + \frac{2\sqrt{n}}{171}$

$\frac{n}{171} \pm \frac{2\sqrt{n}}{171} \Rightarrow [147, 199] \rightarrow ?235$

w/95% prob., we can say the number of calls lies within normal variation.

Chpt. 7, #6

$$Pr\{N_t = n\} = \frac{e^{-\lambda t}(\lambda t)^n}{n!} \quad \text{for all } n = 1, 2, \ldots, n$$

a. Show $E[N_t] = \lambda_t$

- Expected value of Pois. Dist. is mean of Pois Dist.

$pmf = \frac{e^{-\lambda}\lambda^n}{k!}$; $\frac{e^{-\lambda t}(\lambda t)^n}{n!}$; So the mean ~~change~~ is the Expected Value, or λt λ

→ The Same Value (λ) is used for Variance. therefore the new $\lambda = \lambda t$.

b.) $P(153 \leq X \leq 189)$

$$\int_{153}^{189} \frac{e^{-\lambda t}(\lambda t)^n}{n!} = 0.843$$

~~$CI = 171 \pm 1.96 \cdot \frac{171}{\sqrt{12}}$~~ ~~$S = \sqrt{\frac{\lambda}{n}}$~~

~~$CI = 171 \pm 96.79$~~

a.) ~~The~~

c.) $\sum_{n=153}^{189} dpois(x_n, 171) = 0.843$

D.) Because I failed to acknowledge the ~~[illegible]~~ discrete nature of this problem. I performed B incorrectly. However, I would determine a better estimate.

11 | 16 Bombers → High or Low

ChP - Detect → acquire → Hit

AD Type	P(det)	P(aq)		P(hit)	
Lo	.90	0.80	.72	0.05	(shells)
Hi	0.75	0.95	.71	0.70	(missiles)

a.

- Can fire 20 shells/min.
- Can fire 3 missiles/min
- Planes exposed for 1 min low
- Planes exposed for 5 min High

a.) Det. optimal flight path to max. # bombers that survive

Assume Hit = Kill

Lo: 18/ detected

~14.4 acquired

~0.72 Hit/min →

sam

→ 20/min

~~.72~~

~~P(hit|Lo) = 0.72~~

Hi: 15/ detected

~14.25 acquired

~10.08 Hit/min

sam

→ 3/min

~~P(hit|Hi)~~

a.) $P(aq, lo) = 0.72$ $P(H!t \mid Aq) = P(H)P(aq) = 0.036$

$P(aq, Hi) = 0.71$ $P(H!t \mid Aq) = P(H)P(aq) = 0.497$

- Each acquired target is fired at 1 time

$P(H!t, lo) = 0.036 \cdot 20 = 0.72/min \Rightarrow \underline{0.72}$

$P(H!l, HI) = 1.49/min \Rightarrow \underline{\sim 7.5 \text{ dead}}$

b.) 16 bombers

70% chance (each) to dest. target.

X = Rand. variable of success

~~$X \sim Pois(0.7)$~~

~~$X \sim Pois(0.7 \cdot 16)$~~, ~~$X \sim (11.2)$~~

$X \sim Binom(20, 0.7)$ or $X \sim Bernoulli(0.7)$

$P(\text{Destroyed}) = 0.7$

c.) $\mu \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

$0.7 \pm \frac{0.21}{\sqrt{16}} \Rightarrow 0.7 \pm z_{\alpha/2}(0.0525) = 0.7 \pm 1.96(0.0525)$

0.7 ± 0.1029

~~0.7 ± 0.0525~~

~~$(0.6175, 0.7525)$~~

$\boxed{(0.5971, 0.8029)}$