Seventh Homework Set — Solutions
Chapter 4

Problem 55

$$\begin{aligned} P(\text{no errors}) = & \quad P(\text{no errors}|\text{first typist})\, P(\text{first typist}) \\ & + P(\text{no errors}|\text{second typist})\, P(\text{second typist}) \\ = & \quad \frac{1}{2}\left(\frac{3^0}{0!}e^{-3} + \frac{4.2^0}{0!}e^{-4.2}\right) \\ = & \quad \frac{1}{2}\left(e^{-3} + e^{-4.2}\right). \end{aligned}$$

Problem 57 X is Poisson with parameter $\lambda = 3$.

(a) $P\{X \geq 3\} = 1 - P\{0\} - P\{1\} - P\{2\} = 1 - e^{-3}\left(1 + 3 + \frac{9}{2}\right) = 0.5768.$

(b) $P\{X \geq 3 | X \geq 1\} = \frac{P\{X \geq 3\}}{P\{X \geq 1\}} = \frac{P(X \geq 3)}{1 - e^{-3}} = 0.6070.$

Problem 59 Let X be the number of times you win a prize. Then X is binomial with $n = 50$ and $p = \frac{1}{100}$, i.e., we can use the Poisson approximation with $\lambda = 50 \cdot \frac{1}{100} = \frac{1}{2}$.

(a) $P\{X \geq 1\} = 1 - P\{X = 0\} = 1 - e^{-\frac{1}{2}} = 0.3935$

(b) $P\{X = 1\} = \frac{1}{2}e^{-\frac{1}{2}} = 0.3033$

(c) $P\{X \geq 2\} = 1 - P\{X = 0\} - P\{X = 1\} = 1 - e^{-\frac{1}{2}}\left(1 + \frac{1}{2}\right) = 0.0902$

Problem 61 Let X be Poisson with parameter $\lambda = 1000 \cdot 0.0014 = 1.4$. Then $P\{X \geq 2\} = 1 - P\{X = 0\} - P\{X = 1\} = 1 - e^{-1.4}(1 + 1.4) = 0.4082.$

Problem 63 Let X be a Poisson random variable with parameter $\lambda = \frac{5}{2}$. Then X gives a reasonable description of the number of people entering the casino between 12 and 12:05.

(a) $P\{X = 0\} = e^{-\frac{5}{2}} = 0.0821$

(b) $P\{X \geq 4\} = 1 - e^{-\frac{5}{2}}\left(1 + \frac{5}{2} + \frac{25}{8} + \frac{125}{48}\right) = 0.2424$