

Chapter 5

Discrete Probability Distributions

Learning Objectives

1. Understand the concepts of a random variable and a probability distribution.
2. Be able to distinguish between discrete and continuous random variables.
3. Be able to compute and interpret the expected value, variance, and standard deviation for a discrete random variable.
4. Be able to compute and work with probabilities involving a binomial probability distribution.
5. Be able to compute and work with probabilities involving a Poisson probability distribution.
6. Know when and how to use the hypergeometric probability distribution.

Chapter 5

Solutions:

39. a. $f(x) = \frac{2^x e^{-2}}{x!}$

b. $\mu = 6$ for 3 time periods

c. $f(x) = \frac{6^x e^{-6}}{x!}$

d. $f(2) = \frac{2^2 e^{-2}}{2!} = \frac{4(.1353)}{2} = .2706$

Using Excel: POISSON(2,2,FALSE) = .2707

e. $f(6) = \frac{6^6 e^{-6}}{6!} = .1606$

Using Excel: POISSON(6,6,FALSE) = .1606

f. $f(5) = \frac{4^5 e^{-4}}{5!} = .1563$

Using Excel: POISSON(5,4,FALSE) = .1563

40. a. $\mu = 48 (5/60) = 4$

$$f(3) = \frac{4^3 e^{-4}}{3!} = \frac{(64)(.0183)}{6} = .1952$$

b. $\mu = 48 (15 / 60) = 12$

$$f(10) = \frac{12^{10} e^{-12}}{10!} = \text{POISSON}(10,12,\text{FALSE}) = .1048$$

c. $\mu = 48 (5 / 60) = 4$ I expect 4 callers to be waiting after 5 minutes.

$$f(0) = \frac{4^0 e^{-4}}{0!} = \text{POISSON}(0,4,\text{FALSE}) = .0183$$

The probability none will be waiting after 5 minutes is .0183.

d. $\mu = 48 (3 / 60) = 2.4$

$$f(0) = \frac{2.4^0 e^{-2.4}}{0!} = \text{POISSON}(0,2.4,\text{FALSE}) = .0907$$

The probability of no interruptions in 3 minutes is .0907.

41. a. 30 per hour

b. $\mu = 1 (5/2) = 5/2$

$$f(3) = \frac{(5/2)^3 e^{-(5/2)}}{3!} = \text{POISSON}(3,2.5,\text{FALSE}) = .2138$$

c. $f(0) = \frac{(5/2)^0 e^{-(5/2)}}{0!} = \text{POISSON}(0,2.5,\text{FALSE}) = .0821$