

# STAT 515 F16

## Homework 7

- The magnitude of earthquakes recorded in a region of North America can be modeled as having an exponential distribution with mean 2.4, as measured on the Richter scale. Find the probability that an earthquake striking this region will
  - exceed 3.0 on the Richter scale.
  - fall between 2.0 and 3.0 on the Richter scale.
- Suppose that the magnitude of earthquakes striking a region has a gamma distribution with  $\alpha = 0.8$  and  $\beta = 2.4$ .
  - What is the mean magnitude of earthquakes striking the region?
  - What is the probability that the magnitude an earthquake striking the region will exceed 3.0 on the Richter scale?
  - What is the probability that an earthquake striking the regions will fall between 2.0 and 3.0 on the Richter scale?
  - Compare these answers to question 1. For example, which probabilities are larger? Explain.
- The number of defective circuit boards coming off a soldering machine follows a Poisson distribution. During a specific eight-hour day, one defective circuit board was found.
  - Find the probability that it was produced during the first hour of operation during the day.
  - Find the probability that it was produced during the last hour of operation during the day.
  - Given that no defective circuit boards were produced during the first four hours of operation, find the probability that the defective board was manufactured during the fifth hour.
- Wires manufactured for use in a system are specified to have resistances between 0.12 and 0.14  $\Omega$ . The actual measured resistance of the wires produced by company A have a normal distribution with mean 0.13  $\Omega$  and standard deviation 0.005  $\Omega$ .
  - What is the probability that a randomly selected wire from company A's production will meet specifications?
  - If four of these wires are used in each system and all are selected from company A, what is the probability that all four in a randomly selected system will meet the specifications?

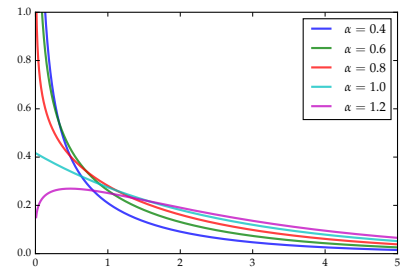


Figure 1: Hint.

5. During an eight-hour shift, the proportion of time  $Y$  that a sheet-metal stamping machine is down for maintenance or repairs has a beta distribution with  $\alpha = 1$  and  $\beta = 2$ . That is

$$f(y) = \begin{cases} 2(1-y), & 0 \leq y \leq 1, \\ 0, & \text{elsewhere.} \end{cases}$$

The cost (in hundreds of dollars) of this downtime, due to lost production and cost of maintenance and repair, is given by  $C = 10 + 20Y + 4Y^2$ . Find the mean and variance of  $C$ .

6. Assume that  $Y$  is normally distributed with mean  $\mu$  and standard deviation  $\sigma$ . After observing a value of  $Y$ , a mathematician constructs a rectangle with length  $L = |Y|$  and width  $W = 6|Y|$ . Let  $A$  denote the area of the resulting rectangle. What is  $E(A)$ ?