ST 501/601 Assignment 4

Instruction

The assignment is due on **Friday, October 4** at 11:59pm EDT. Please submit your assignment electronically through the **Moodle** webpage. **All problems**, unless stated otherwise, are from your textbook *Mathematical Statistics and Data Analysis* by John A. Rice. Therefore, when we write problem $x.y$ we meant problem y from chapter x of the textbook.

Problem List

- Problem 1: A small market orders copies of a certain magazine for its magazine rack each week. Let X denote the demand for the magazine, with probability mass function (pmf)

  $$P(X=1)=\tfrac{1}{15},\quad P(X=2)=\tfrac{2}{15},\quad P(X=3)=\tfrac{3}{15},\quad P(X=4)=\tfrac{4}{15},\quad P(X=5)=\tfrac{3}{15},\quad P(X=6)=\tfrac{2}{15}$$

  Suppose the store owner actually pays \$2.00 for each copy of the magazine and the price to customers is \$4.00. If magazines left at the end of the week have no salvage value, is it better to order three or four copies of the magazine? [Hint: For both three and four copies ordered, express net revenue as a function of demand X, and then compute the expected revenue.]

- Problem 2: Let X be the damage incurred (in \$) in a certain type of accident during a given year. Possible X values are 0, 1000, 5000, and 10000, with probabilities .8, .1, .08, and .02, respectively. A particular company offers a \$500 deductible policy. If the company wishes its expected profit to be \$100, what premium amount should it charge?

- Problem 3: A geologist has collected 10 specimens of basaltic rock and 10 specimens of granite. The geologist instructs a laboratory assistant to randomly select 15 of the speci- mens for analysis.

  (a) What is the probability that all specimens of one of the two types of rock are selected for analysis?
  (b) What is the probability that the number of granite specimens selected for analysis is within 1 standard deviation of its mean value?

- Problem 4: Organisms are present in ballast water discharged from a ship according to a Poisson process with a concentra- tion of 10 organisms per cubic meter.

  (a) What is the probability that one cubic meter of discharge contains at least 8 organisms?
  (b) What is the probability that the number of organisms in 1.5 cubic meter of discharge exceeds its mean value by more than one standard deviation?
  (c) For what amount of discharge would the probability of containing at least 1 organism be .999 ?

- Problem 5: Automobiles arrive at a vehicle equipment inspection station according to a Poisson process with rate of 10 per hour. Suppose that with probability 0.5 an arriving vehicle will have no equipment violations. What is the probability that ten "no-violation" cars arrive during the next hour?

- Problem 4.87