Introduction to Probability

Tutorial 10

1. Consider the Air Conditioner Maintenance Example in Lecture 10.

   (a) Suppose that a location has only one air conditioner that needs servicing. What is the conditional probability mass function of the service time required?
   What are the conditional expectation and standard deviation of the service time?

   (b) Suppose that a location requires a service time of 2 hours. What is the conditional probability mass function of the number of air conditioner units serviced?
   What are the conditional expectation and standard deviation of the number of air conditioner units serviced?

2. Do the exercise on Slide 17 of Lecture 10.

3. Two safety inspectors inspect a new building and assign it a "safety score" of 1, 2, 3, or 4. Suppose that the random variable X is the score assigned by the first inspector and the random variable Y is the score assigned by the second inspector, and that they have a joint probability mass function given below.

Y \ X	1	2	3	4
1	0.09	0.03	0.01	0.01
2	0.02	0.15	0.03	0.01
3	0.01	0.01	0.24	0.04
4	0.00	0.01	0.02	0.32

   (a) What is the probability that both inspectors assign the same safety score?

   (b) What is the probability that the second inspector assigns a higher safety score than the first inspector?

   (c) What are the marginal probability mass function, expectation, and variance of the score assigned by the first inspector?

   (d) What are the marginal probability mass function, expectation, and variance of the score assigned by the second inspector?

(e) Are the scores assigned by the two inspectors independent of each other? Would you expect them to be independent? How would you interpret the situation if they were independent?

(f) If the first inspector assigns a score of 3, what is the conditional probability mass function of the score assigned by the second inspector?

(g) What is the covariance of the scores assigned by the two inspectors?

(h) What is the correlation between the scores assigned by the two inspectors? If you are responsible for training the safety inspectors to perform proper safety evaluations of buildings, what correlation value would you like there to be between the scores of two safety inspectors?