Chapter 10 - Association between Random Variables

41. Drivers for a freight company make a varying number of delivery stops. The mean number of stops is 6 with standard deviation 2. Two drivers operate independently of one another.

- (a) Identify the two random variables and summarize your assumptions.

- (b) What is the mean and standard deviation of the number of stops made in a day by these two drivers?

- (c) If each stop by one driver takes 1 hour and each stop by the other takes 1.5 hours, how many hours do you expect these two drivers to spend making deliveries?

- (d) Find the standard deviation of the amount of time needed for deliveries in part (c).

- (e) It is more likely the case that the driver who spends more time making deliveries also has fewer to make, and conversely that the other driver has more deliveries to make. Does this suggest that the two random variables may not meet the assumptions of the problem?

43. Customers at a fast-food restaurant buy both sandwiches and drinks. The following joint distribution summarizes the numbers of sandwiches (*X*) and drinks (*Y*) purchased by customers.

		X	
		1 sandwich	2 sandwiches
	1 drink	0.40	0.20
Y	2 drinks	0.10	0.25
	3 drinks	0	0.05

- (a) Find the expected value and variance of the number of sandwiches.

- (b) Find the expected value and variance of the number of drinks.

- (c) Find the correlation between *X* and *Y*. (*Hint:* You might find the calculations easier if you use the alternative expression for the covariance shown in the Formulas section at the end of the chapter.)

- d) Interpret the size of the correlation for the manager of the restaurant.

- (e) If the profit earned from selling a sandwich is $1.50 and from a drink is $1.00, what is the expected value and standard deviation of the profit made from each customer?

- (f) Find the expected value of the ratio of drinks to sandwiches. Is it the same as μ_Y/μ_X?

49. A construction firm places bids on various portions of the work in building a new office tower. The key bids it submits are for electrical work and for plumbing. The bid for the electrical work estimates 64 weeks of labor (e.g., 1 electrician for 64 weeks or 8 for 8 weeks). The bid for the plumbing estimates 120 weeks of labor. Standard procedures indicate that the standard deviations for these estimates are 6 weeks for electrical work and 15 weeks for plumbing.

- (a) Find the expected number of weeks of labor provided by the company if it wins both bids.

- (b) Would you expect to find positive, negative, or no correlation between the numbers of weeks of the two types of labor needed for the construction?

- (c) Find the standard deviation of the total number of weeks of work if the correlation between the weeks of labor for electrical work and plumbing is $\rho=0.7$.

- (d) What is the effect of the dependence between the number of weeks of electrical and plumbing labor? In particular, when preparing bids, would the firm prefer more or less dependence?

- (e) The firm earns a profit of $200 per week of electrical work and a profit of $300 per week of plumbing work. What are the expected profits from this contract and the standard deviation of those profits? Assume $\rho=0.7$ as in part (c).

- (f) Do you think that the firm will make more than $60,000 on this contract?