5.72 Two random variables are independent and each has a binomial distribution with success probability 0.4 and 2 trials.

(a) Find the joint probability distribution.

(b) Find the probability that the second random variable is greater than the first.

5.111 In certain experiments, the error made in determining the density of a silicon compound is a random variable having the probability density

$$f(x) = \begin{cases} 25 & \text{for } -0.02 < x < 0.02 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probabilities that such an error will be

(a) between -0.03 and 0.04;

(b) between -0.005 and 0.005.

6.3 Explain why the following will not lead to random samples from the desired populations.

(a) To determine what the average person spends on a vacation, a market researcher interviews passengers on a luxury cruise.

(b) To determine the average income of its graduates 10 years after graduation, the alumni office of a university sent questionnaires in 2010 to all the members of the class of 2000 and based its estimate on the questionnaires returned.

(c) To determine public sentiment about certain import restrictions, an interviewer asks voters: "Do you feel that this unfair practice should be stopped?"

6.5 How many different samples of size $n = 2$ can be chosen from a finite population of size

(a) $N = 7$;

(b) $N = 24$?

6.7 Take 30 slips of paper and label five each -4 and 4, four each -3 and 3, three each -2 and 2, and two each $-1, 0$ and 1.

(a) If each slip of paper has the same probability of being drawn, find the probability of getting $-4, -3, -2, -1, 0, 1, 2, 3, 4$ and find the mean and the variance of this distribution.

(b) Draw 50 samples of size 10 from this population, each sample being drawn without replacement, and calculate their means.

(c) Calculate the mean and the variance of the 50 means obtained in part (b).

(d) Compare the results obtained in part (c) with the corresponding values expected according to Theorem 6.1. [Note that μ and σ^2 were obtained in part (a).]

6.10 Suppose that we convert the 50 samples referred to on page 179 into 25 samples of size $n = 20$ by combining the first two, the next two, and so on. Find the means of these samples and calculate their mean and their standard deviation. Compare this mean and this standard deviation with the corresponding values expected in accordance with Theorem 6.1.

(the data is available on lecture notes Chapter 6, pages 9 and 10)

6.11 When we sample from an infinite population, what happens to the standard error of the mean if the sample size is

(a) increased from 50 to 200;

(b) increased from 400 to 900;

(c) decreased from 225 to 25;

(d) decreased from 640 to 40?

6.13 For large sample size n, verify that there is a 50-50 chance that the mean of a random sample from an infinite population with the standard deviation σ will differ from μ by less than $0.6745 \cdot \sigma/\sqrt{n}$. It has been the custom to refer to this quantity as the **probable error of the mean**.

6.17 If the distribution of the weights of all men traveling by air between Dallas and El Paso has a mean of 163 pounds and a standard deviation of 18 pounds, what is the probability that the combined gross weight of 36 men traveling on a plane between these two cities is more than 6,000 pounds?