



22. Loading Aircraft Before every flight, the pilot must verify that the total weight of the load is less than the maximum allowable load for the aircraft. The Bombardier Dash 8 aircraft can carry 37 passengers, and a flight has fuel and baggage that allows for a total passenger load of 6200 lb. The pilot sees that the plane is full and all passengers are men. The aircraft will be overloaded if the mean weight of the passengers is greater than $6200 \text{ lb}/37 = 167.6 \text{ lb}$. What is the probability that the aircraft is overloaded? Should the pilot take any action to correct for an overloaded aircraft? Assume that weights of men are normally distributed with a mean of 182.9 lb and a standard deviation of 40.8 lb (based on Data Set 1 in Appendix B).

6-5 Beyond the Basics

23. Correcting for a Finite Population In a study of babies born with very low birth weights, 275 children were given IQ tests at age 8, and their scores approximated a normal distribution with $\mu = 95.5$ and $\sigma = 16.0$ (based on data from “Neurobehavioral Outcomes of School-age Children Born Extremely Low Birth Weight or Very Preterm,” by Anderson et al., *Journal of the American Medical Association*, Vol. 289, No. 24). Fifty of those children are to be randomly selected for a follow-up study.

a. When considering the distribution of the mean IQ scores for samples of 50 children, should $\sigma_{\bar{x}}$ be corrected by using the finite population correction factor? Why or why not? What is the value of $\sigma_{\bar{x}}$?

b. Find the probability that the mean IQ score of the follow-up sample is between 95 and 105.

24. Correcting for a Finite Population The Orange County Spa began with 300 members. Those members had weights with a distribution that is approximately normal with a mean of 177 lb and a standard deviation of 40 lb. The facility includes an elevator that can hold up to 16 passengers.

a. When considering the distribution of sample means from weights of samples of 16 passengers, should $\sigma_{\bar{x}}$ be corrected by using the finite population correction factor? Why or why not? What is the value of $\sigma_{\bar{x}}$?

b. If the elevator is designed to safely carry a load of up to 3000 lb, what is the maximum safe mean weight of passengers when the elevator is loaded with 16 passengers?

c. If the elevator is filled with 16 randomly selected club members, what is the probability that the total load exceeds the safe limit of 3000 lb? Is this probability low enough?

d. What is the maximum number of passengers that should be allowed if we want at least a 0.999 probability that the elevator will not be overloaded when it is filled with randomly selected club members?

25. Population Parameters Use the same population of {4, 5, 9} from Example 1 in Section 6-4. Assume that samples of size $n = 2$ are randomly selected *without* replacement.

a. Find μ and σ for the population.

b. After finding all samples of size $n = 2$ that can be obtained *without* replacement, find the population of all values of \bar{x} by finding the mean of each sample of size $n = 2$.

c. Find the mean $\mu_{\bar{x}}$ and standard deviation $\sigma_{\bar{x}}$ for the population of sample means found in part (b).

d. Verify that

$$\mu_{\bar{x}} = \mu \quad \text{and} \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$$