d. Find P_{30}, the bone density test score separating the bottom 30% from the top 70%.

e. If the mean bone density test score is found for 16 randomly selected subjects, find the probability that the mean is greater than 0.27.

2. Door Peephole Standing eye heights of women are normally distributed with a mean of 1516 mm and a standard deviation of 63 mm (based on anthropometric survey data from Gordon, Churchill, et al.).

a. A door peephole is placed at a height that is uncomfortable for women with standing eye heights greater than 1605 mm. What percentage of women will find that height uncomfortable?

b. In selecting the height of a door peephole, the architect wants its height to be suitable for the highest 99% of standing eye heights of women. What standing eye height of women separates the highest 99% of standing eye heights from the lowest 1%?

3. Window Placement Standing eye heights of men are normally distributed with a mean of 1634 mm and a standard deviation of 66 mm (based on anthropometric survey data from Gordon, Churchill, et al.).

a. If a window is positioned so that it is comfortable for men with standing eye heights greater than 1500 mm, what percentage of men will find that height comfortable?

b. A window is positioned to be comfortable for the lowest 95% of eye heights of men. What standing eye height of men separates the lowest 95% from the highest 5%?

4. Sampling Distributions Scores on the ACT test have a distribution that is approximately normal with mean 21.1 and standard deviation 5.1. A sample of 80 ACT scores is randomly selected and the sample mean is computed.

a. Describe the distribution of such sample means.

b. What is the mean of all such sample means?

c. What is the standard deviation of all such sample means?

5. Unbiased Estimators

a. What is an unbiased estimator?

b. For the following statistics, identify those that are unbiased estimators: mean, median, range, variance, proportion.

c. Determine whether the following statement is true or false: "The sample standard deviation is a biased estimator, but the bias is relatively small in large samples, so s is often used to estimate σ."

6. Monorail and Airliner Doors The Mark VI monorail used at Disney World has doors with a height of 72 in. Heights of men are normally distributed with a mean of 69.5 in. and a standard deviation of 2.4 in. (based on Data Set 1 in Appendix B).

a. What percentage of adult men can fit through the doors without bending? Does the door design with a height of 72 in. appear to be adequate? Explain.

b. What doorway height would allow 99% of adult men to fit without bending?

7. Aircraft Safety Standards Under older Federal Aviation Administration rules, airlines were required to estimate the weight of a passenger as 185 lb. (That amount is for an adult traveling in winter, and it includes 20 lb of carry-on baggage.) Rules were revised to use an estimate of 195 lb. Men now have weights that are normally distributed with a mean of 182.9 lb and a standard deviation of 40.9 lb (based on Data Set 1 in Appendix B).

a. If 1 adult male is randomly selected and is assumed to have 20 lb of carry-on baggage, find the probability that his total weight is greater than 195 lb.