Lesson 7: Probability Calculations Involving a Mean Response

Homework

Instructions: You are encouraged to collaborate with other students on the homework, but it is important that you do your own work. Before working with someone else on the assignment, you should attempt each problem on your own.

Problems

1. What is meant by the term "distribution of sample means"? Review Lesson 6 for the definition. Write a few sentences to explain this concept in your own words.

The Graduate Management Admission Test (GMAT) is used as an admission criterion in many masters of business administration (MBA) programs. The scores on the GMAT are normally distributed with a mean of 529 and a standard deviation of 113. The minimum GMAT score required for admission to the MAcc program in the School of Accountancy and Information Systems at BYU is 550. Use this information to answer questions 2 through 8.

2. Find the z-score corresponding to a GMAT score of 550.
3. What is the probability that a randomly selected student will score above 550 on the GMAT?

Consider a simple random sample (SRS) of n = 30 students taking the GMAT.

4. What is the mean of the distribution of sample means scores for all such samples?
5. What is the standard deviation of the distribution of sample means scores for all such samples?
6. What is the shape of the distribution of sample means scores for all such samples?
7. Find the z-score corresponding to a sample mean GMAT score for n=30 students of 550.
8. What is the probability that the sample mean GMAT score for a simple random sample of 30 students will be above 550?

Suppose the mean GPA of BYU-Idaho students is 3.5 and the standard deviation is 0.7. It is well known that this distribution is left-skewed. Use this information to answer questions 9 and 10.

9. If you take a random sample of 81 BYU-Idaho students, what is the distribution of sample means of these GPA's? Give the shape, the mean, and the standard deviation.
10. What is the probability that the mean GPA for 81 randomly selected BYU-Idaho students will be less than 3.3?

The most famous geyser in the world, Old Faithful in Yellowstone National Park, has a mean time between eruptions of 85 minutes. The interval of time between eruptions is normally distributed with a standard deviation of 21.25 minutes. Use this information to answer questions 11 and 12.

11. What is the probability that a randomly selected time interval between eruptions is greater than 95 minutes?

12. Suppose a simple random sample (SRS) of 10 time intervals between eruptions was measured. What is the probability that a random sample of 10 time intervals between eruptions has a mean longer than 95 minutes?

The label on a one gallon jug of milk states that the volume of milk is 128 fluid ounces (fl.oz.) Federal law mandates that the jug must contain no less than the stated volume. The actual amount of milk in the jugs is normally distributed with mean $\mu = 129$ fl. Oz. and standard deviation $\sigma = 0.8$ fl. Oz.. Use this information to answer questions 13 through 16.

13. Find the z-score corresponding to a jug containing 128 fl. Oz. of milk.

14. What is the probability that a randomly selected jug will contain less than 128 fl. Oz. of milk?

15. Each shift, eight jugs of milk are randomly selected for thorough testing. The products are tested for filling volume, temperature, contamination, fat content, packaging defects, label placement, etc. Find the z-score corresponding to a sample mean volume for eight jugs of 128 fl. Oz.

16. What is the probability that the sample mean volume for eight jugs is below 128 fl. Oz.? (Give your answer accurate to 4 decimal places.)

17. Compare the z-score and probability from questions 13 and 14 to the z-score and probability from questions 15 and 16. What happens to the probability when a z-score is further away from the center of a normal distribution? Why is this happening?