MATH 262 - Applied Statistics
Lab 3: Sampling Distributions and the Central Limit Theorem

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Problem 1. The Medical College Admission Test (MCAT) is a standardized test taken by applicants to medical school. To estimate the mean score μ of those who took the MCAT on your campus, you will obtain the scores of a simple random sample of students. MCAT scores follow a normal distribution with standard deviation 10.4. Suppose that (unknown to you) the mean score of those taking the MCAT on your campus is 500.

(a) If you choose one student at random, what is the probability that the student's score is between 495 and 505?

(b) You sample 25 students. What is the sampling distribution of their average score $\bar{x}$?

(c) What is the probability that the mean score of your sample is between 495 and 505?

Problem 2. In order to determine how many passengers can safely board an airplane, airlines assume that the average weight of a passenger is 195 pounds with standard deviation of 35 pounds. A regional airplane carries 22 passengers. What is the approximate probability that the total weight of the passengers exceeds 4500 pounds?

Problem 3. The amount of time in hours that a technician requires to perform preventitive maintenance on a furnace has mean time $\mu = 1$ hour and standard deviation $\sigma = 1$ hour. An HVAC company wants to schedule technicians' time for a visit to an apartment building with 70 furnaces. The company is considering budgeting an average of either 1.1 hours or 1.25 hours for each unit. As the company statistician, you are asked to determine which of these two options is more appropriate. To help you make this decision, answer the following questions:

(a) What are the parameters of the sampling distribution of the mean for 70 furnaces?

(b) What is the probability that the average maintenance time for 70 furnaces will be greater than 1.1 hours?

(c) What is the probability that the average maintenance time for 70 furnaces will be greater than 1.25 hours?

(d) Based on your answers to (b) and (c), which of the two options would you recommend and why?