

PSYCH 240: Statistics in Psychology
ASSIGNMENT 3: SAMPLING AND PROBABILITY

Purpose: Sampling distributions are useful for describing the probabilities associated with sample statistics (like the mean). This assignment is designed to give you practice in thinking about sampling distributions and calculating standard errors and probabilities from them.

Short Essay Question (20 pts.): Please provide a typewritten answer to the following essay question.

1. What is the central limit theorem and what does it tell us about the location, variability, and shape of the sampling distribution of the mean?

Problem-Based Questions (40 pts. each): Please show all work and clearly identify the final answer for each of the following questions.

1. Suppose that an instructor has given a test so many times before that she knows that the scores are normally distributed with a mean of 75 and a standard deviation of 9.1 (in other words, these are the population parameters). She is giving the test to new classes this semester and is curious about her classes' chances of getting certain scores. (4 points)
 - a. What is the probability that a class ($N = 16$) will have a mean of 70 or lower? 80 or higher?
 - b. What is the probability that a class ($N = 25$) will have a mean of 70 or lower? 80 or higher?
 - c. What is the probability that a class ($N = 36$) will have a mean between 70 and 80?
 - d. Drawing on your answers above, describe the impact of sample size on the standard error of the mean. How does this ultimately affect the obtained probability?
2. Suppose that a cognitive psychologist was interested in determining how much psychology jargon ("psychology words") her students are likely to be able to list in a memory recall task. Previous research has shown (see table below) that the populations of these students are generally able to list the same number of words, but that the variability is reduced in the more advanced students. Further suppose that the instructor has a class with 30 sophomores, a class with 30 juniors, and a class with 30 seniors; she wants to know what means she can reasonably expect from her students.

Students	μ	σ
Sophomores	36	8
Juniors	36	6
Seniors	36	4

- a. For each class, determine a range of means that indicate the most likely 95% and the most likely 99% means. [In other words, calculate "intervals" that would contain the middle 95% and middle 99% of the means.] (3 pts.)
- b. Drawing on your answers above, describe the impact of different standard deviations on the standard errors and on the width of the "intervals." In other words, how does variability in the population affect both the variability of our sampling distribution and also the range of "likely" results? (1 pt.)