

Math 263 Exam 2 Review

Basic Probability

Choose a young adult at random. The probability is 0.12 that the person chosen did not complete high school, 0.31 that the person has a high school diploma but no further education, and 0.29 that the person has at least a bachelor's degree.

- What must be the probability that a randomly chosen young adult has some education beyond high school but does not have a bachelor's degree?
- What is the probability that a randomly chosen young adult has at least a high school education?

Conditional Probability and Independence

Motor vehicles sold to individuals are classified as either cars or light trucks and as either domestic or imported. In a recent year, 69% of vehicles sold were light trucks, 78% were domestic, and 55% were domestic light trucks. Let A to be the event that a vehicle is a car and B to be that it is imported.

- The probability that the vehicle is a light truck
- The vehicle is an imported car
- Given that a vehicle is imported, what is the conditional probability that it is a light truck?
- Are the events "vehicle is a light truck" and "vehicle is imported" independent?

Mean and Variance

A study of working couples measures the income X of the husband and the income Y of the wife in a large number of couples in both partners are employed. Suppose that you knew the means μ_X and μ_Y and the variances σ_X and σ_Y of both variables in the population.

- What is the mean of total income?
- What is the mean of the difference of income between husband and wife?
- What is the standard deviation of the total income?
- What is the standard deviation of the difference of income between husband and wife?

CLT

1. For a multiple-choice test, suppose that each student has probability p of correctly answering a question chosen at random. The correctness of an answer to a question is independent of the correctness of the answers to other questions. Assume Jodi has $p = 0.88$.
 - a. Use Normal approximation to find the probability that Jodi scores 85% or lower on a 100-question test.
 - b. If the test contains 250 questions, what is the probability that Jodi will score 85% or lower?
 - c. How many questions must the test contain in order to reduce the standard deviation of Jodi's proportion of correct answers to half its value for a 100-item test?

2. The gypsy moth is a serious threat to oak and aspen trees. A state agriculture department places traps throughout the state to detect the moths. When traps are checked periodically, the mean number of moths trapped is only 0.5, but some traps have several moths. The distribution of moth counts is discrete and strongly skewed, with standard deviation 0.7.
 - a. What are the mean and standard deviation of the average number of moths \bar{x} in 50 traps?
 - b. Use the CLT to find the probability that the average number of moths in 50 traps is greater than 0.6.