

STA 200 Statistics: A Force in Human Judgment

STA 200 Course Competencies

General Education Competencies

- A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.
- B. Intellectual and practical skills, including
 - inquiry and analysis
 - critical and creative thinking
 - written and oral communication
 - quantitative literacy
 - information literacy
 - teamwork and problem solving
- C. Personal and social responsibility, including
 - civic knowledge and engagement (local and global)
 - intercultural knowledge and competence
 - ethical reasoning and action
 - foundations and skills for lifelong learning
- D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Student Learning Outcomes for Quantitative Reasoning

In STA 200, students will learn to:

1. Interpret information presented in mathematical and/or statistical forms by:
 - Identifying various sampling methods and understanding the concept of random sampling.
 - Identifying various types of studies, including experiments and observational studies.
 - Understanding concepts relating to the validity and reliability of statistical measures.
 - Classifying data by type and level of measurement.
 - Computing and interpreting measures of central tendency, dispersion, and position.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically by:
 - Translating data into tables and graphs.
 - Graphing the relationship between variables using a scatterplot.

3. Determine when computations are needed and execute the appropriate computations by:
 - Applying the basic principles of probability.
 - Computing probabilities for normal distributions.
4. Apply an appropriate model to the problem to be solved by:
 - Understanding and interpreting linear correlation.
 - Understanding the concept of linear regression and making predictions using the linear equation.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis by:
 - Performing and interpreting one-sample confidence intervals based on the standard normal distribution.
 - Performing and interpreting one-sample hypothesis tests based on the standard normal distribution.

STA 200 Course Outline

- I. Understanding Statistics
 - A. Define statistics
 - B. Understand that statistics is used to make relevant decisions
 - C. Understand the distinction between statistical science and the reporting of numerical facts
- II. Experiments & Observational Studies
 - A. Questions & Measures – Understand and distinguish between:
 1. Reliability
 2. Validity
 3. Bias
 4. Variability
 - B. Random Variables
 1. Determine categorical and measurement variables
 2. Determine continuous and discrete variables
 3. Identify experimental variables
 - a. Response
 - b. Explanatory
 - c. Confounding
 - d. Interacting
 - e. Lurking
 - C. Experiments – Understand and identify use of the following elements:
 1. Treatments
 2. Control groups, placebo and placebo effect
 3. Experimental Design

4. Randomization
 5. Causation
 - D. Observational Studies – Understand and identify use of the following elements:
 1. Types of observational studies
 - a. Case-control study
 - b. Retrospective study
 - c. Prospective study
 2. Efficacy
- III. Sampling – Indicate knowledge of purpose and importance of random sampling
- A. Terminology
 1. Population
 2. Sampling frame
 3. Sample
 - B. Margin of Error
 - C. Sampling methods
 1. Simple Random Sampling
 2. Stratified Random Sampling
 3. Systematic Random Sampling
 4. Other Sampling Methods
 - D. Sampling variability
 1. Behavior of sample proportions
 2. Behavior of sample means
- IV. Descriptive Statistics
- A. Statistic vs. Parameter – Define and understand statistic and parameter
 - B. Measures of central tendency – Determine when use is appropriate and compute
 1. Mean
 2. Median
 3. Mode
 - C. Measures of dispersion – Understand relationship and purpose
 1. Variance
 2. Standard deviation
 3. Quartiles
 - D. Graphical Displays
 1. Displays for Measurement Data – Understand and determine appropriateness, shape, variability, etc.
 - a. Histogram
 - b. Stemplot
 - c. Boxplot
 - d. Scatterplot
 - e. Line Graph

2. Displays for Categorical Data – Understand and determine appropriateness
 - a. Bar graph
 - b. Pie chart
 - c. Pictogram
- V. Inferential Statistics
- A. Confidence Intervals – Knowledge and understanding of confidence interval and purpose
 1. Margin of Error
 2. Standard error
 3. Confidence level
 4. Interval interpretation
 - B. Hypothesis Testing - Knowledge and understanding of hypothesis test and purpose
 1. Null & Alternative hypotheses
 2. Test statistic
 3. Significance level
 4. Type I and Type II errors
 5. Statistical significance
 6. Test interpretation
- VI. Normal Distribution – Understand and determine information related to the normal distribution
- A. Standard Score
 - B. Percentiles and probabilities
 - C. Empirical Rule
 - D. Relation to sampling variability
- VII. Relationships – Indicate knowledge and understanding in determining types of relationships and their implications
- A. Measurement variables
 1. Scatterplots
 2. Correlation
 3. Regression
 - a. Least squares equation prediction
 - b. Coefficient interpretation
 4. Coefficient interpretation
 - B. Categorical variables
 1. Conditional percentages
 2. Risk
- VIII. Probability – Knowledge and understanding of basic probability rules and computations
- A. Relative frequency
 - B. Accumulated probability

- C. Expected Value
- D. Probability rules
 - 1. Multiplication rule
 - 2. Addition rule
 - 3. Conditional probability
 - 4. Independence
- E. False Positives