

Elementary Statistical Methods

Class

MATH 1342

Collection, analysis, presentation and interpretation of data, and probability. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Use of appropriate technology is recommended. An elementary course in statistics including the following topics and their applications in various fields: probability, population sampling, collection and analysis of data, tabulation and graphing of data, frequency distributions, mean, median, mode, standard deviation, correlation and regression, the normal distribution, confidence intervals, binomial distribution, and hypothesis testing.

Competencies

1. To demonstrate competency in explaining the use of data collection and statistics as tools to reach reasonable conclusions, the student should be able to:
 - i. Use the proper terms to be able to communicate statistical ideas.
 - ii. Determine the difference between descriptive statistics and inferential statistics.
 - iii. Demonstrate an ability to understand the statistical terms that are commonly used in textbooks, newspapers, magazines, and on television and radio in society today.
2. To demonstrate competency in understanding and using frequency distributions and graphs to describe data, the student should be able to:
 - i. Organize a frequency distribution.
 - ii. Draw histograms to illustrate data in frequency distributions.
 - iii. Interpret and draw other commonly used graphs including time series graphs, Pareto charts, pie graphs, and stem and leaf plots.
3. To demonstrate competency in recognizing, examining and interpreting the basic principles of describing and presenting data, the student should be able to:
 - i. Calculate and interpret common measures of central tendency such as mean, median, and mode using both grouped and ungrouped data.
 - ii. Calculate a weighted mean.
 - iii. Calculate and interpret common measures of variability such as range, standard deviation, and variance for both grouped and ungrouped data.
 - iv. Calculate z-scores (standard scores) and quartiles to determine the relative positions of raw scores in a data set.
 - v. Use the Empirical Rule to describe data that are bell shaped, and use Chebyshev's Inequality to describe any sets of data.
 - vi. Determine and interpret the interquartile range.
 - vii. Determine outliers for a set of data.
 - viii. Draw box plots for data sets.
4. To demonstrate competency in computing and interpreting empirical and theoretical probabilities using the rules of probabilities and combinatorics, the student should be able to:
 - i. Calculate probabilities by using sample spaces.
 - ii. Determine the complement of an event and to calculate the corresponding probability.
 - iii. Recognize the difference between classical, empirical, and subjective probability.
 - iv. Calculate probability using the addition rules.
 - v. Recognize mutually exclusive events in order to correctly calculate the corresponding probabilities.
 - vi. Find the probability of two or more independent events.
 - vii. Find the probability of two or more dependent events.
 - viii. Apply the formula for conditional probability.
 - ix. Calculate probabilities using terms such as "and," "or," and "at least one."
 - x. Use tree diagrams as a counting technique.
 - xi. Calculate with counting techniques using multiplication rules.
 - xii. Recognize permutations and to count outcomes using permutation formulas.
 - xiii. Recognize combinations and to count outcomes using combination formulas.
 - xiv. Use counting rules to find probabilities.
5. To demonstrate competency in examining, analyzing and comparing various sampling distributions for both discrete and continuous random variables, the student should be able to:

- i. Construct a probability distribution for a random variable.
 - ii. Determine the mean, variance, standard deviation, and the expected value for a discrete random variable.
 - iii. Compute probabilities of binomial experiments.
 - iv. Compute the mean and standard deviation of a binomial random variable.
6. To demonstrate competency in analyzing data by comparing to the normal distribution, the student should be able to:
 - i. Identify distributions as symmetrical or skewed.
 - ii. Identify the properties of the normal distribution.
 - iii. Find the area under the standard normal distribution given various z values.
 - iv. Find probabilities for a normally distributed variable by transforming it into a standard normal variable.
 - v. Find specific data values for given percentages using the standard normal distribution.
 - vi. Use the central limit theorem to solve problems involving sample means for large and small samples
 - vii. Use the normal approximation to compute probabilities for a binomial variable.
 - viii. Compute probabilities of a sample proportion.
7. To demonstrate competency in describing and computing confidence intervals, the student should be able to:
 - i. Find the confidence interval for the mean.
 - ii. Find confidence intervals and sample size for proportions.
8. To demonstrate competency in performing hypothesis testing using statistical methods, the student should be able to:
 - i. Understand the definitions used in hypothesis testing.
 - ii. State the null and alternative hypotheses.
 - iii. Find critical values.
 - iv. State the five steps used in hypothesis testing.
 - v. Test means using the t test.
 - vi. Test proportions using the z test.
 - vii. Explain the relationship between type I and type II errors.
 - viii. Test the difference between two large sample means using the z test (optional).
 - ix. Test the difference between two proportions using the z test (optional).
9. To demonstrate competency in solving linear regression and correlation problems, the student should be able to:
 - i. Draw a scatter plot for a set of ordered pairs.
 - ii. Find the Pearson product moment correlation coefficient.
 - iii. Determine whether a linear relationship exists between two variables.
 - iv. Find the equation of the regression line.
 - v. Make predictions when an appropriate correlation exists.

Campus Resources for Students

Weatherford:

The Academic Support Center is a free public tutoring service provided by the college, offered in LART- LL Room 2, 817-598-6278

Video tapes

Computer assisted instruction

Instructor's office hours

Course Learning Objectives

Upon successful completion of this course, students will:

1. Explain the use of data collection and statistics as tools to reach reasonable conclusions.
2. Recognize, examine and interpret the basic principles of describing and presenting data.
3. Compute and interpret empirical and theoretical probabilities using the rules of probabilities and combinatorics.
4. Explain the role of probability in statistics.

5. Examine, analyze and compare various sampling distributions for both discrete and continuous random variables.
6. Describe and compute confidence intervals.
7. Solve linear regression and correlation problems.
8. Perform hypothesis testing using statistical methods.

Required Textbooks

Fundamentals of Statistics, 5th edition, Michael Sullivan, III, 2014, Pearson, MyLabsPlus access code required.

Required Supplies

Calculator is required. See instructor.

Evaluation Standards

These course objectives and student learning outcomes will be assessed through the administration of a minimum of 3 in-class exams (65%), quizzes and/or homework (15%), and a comprehensive, departmental final exam (20%).

Only departmental formula sheets supplied by the instructor will be used on the exams and the final exam.

Notes, textbooks, note cards, formula sheets, or any other additional materials will NOT be approved for use on exams. Any use will be an academic integrity violation.

Disabilities**ADA Statement:**

Any student with a documented disability (e.g. learning, psychiatric, vision, hearing, etc.) may contact the Office on the Weatherford College Weatherford Campus to request reasonable accommodations. *Phone:* 817-598-6350
Office Location: Office Number 118 in the Student Services Building, upper floor. *Physical Address:* Weatherford College 225 College Park Drive Weatherford, TX.

Academic Integrity

Academic Integrity is fundamental to the educational mission of Weatherford College, and the College expects its students to maintain high standards of personal and scholarly conduct. Academic dishonesty of any kind will not be tolerated. Academic dishonesty includes, but is not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials including unauthorized use of Generative AI. Departments may adopt discipline specific guidelines on Generative AI usage approved by the instructional dean. Any student who is demonstrated to have engaged in any of these activities will be subject to immediate disciplinary action in accordance with institutional procedures.

Lab Fee

\$24