South Central College

MATH 154 Elementary Statistics

Common Course Outline

Course Information

Description This course introduces the essential mathematical elements of statistics, applying them to a broad range of areas, including business, economics, and the physical, biological and social sciences. Topics include measures of central tendency and dispersion, variability, graphical displays, normal and t-distributions, hypothesis testing, confidence intervals, estimation, linear regression, correlation, and other selected statistical topics. Math 154 satisfies the MNTC Category 4 Mathematical/Logical Reasoning requirement. (Prerequisite: Corequisite enrollment in MATH 0099, OR Completion of MATH 0099 OR MATH 0085 OR MATH 0095 with a grade of C or higher, OR NextGen score of 250-300 QAS, OR ACT score of 19+, OR MCA score of 1148+, OR an Accuplacer test score of 56 or above in Arithmetic AND a score of 76 or above in Elementary Algebra).

Total Credits 4

Total Hours 64

Types of Instruction

Instruction Type	Credits/Hours
Lecture	4/64

Pre/Corequisites

Prerequisite Corequisite enrollment in MATH 0099, OR Completion of MATH 0099 with a grade of C or higher (2.0), OR Completion of MATH 0085 with a grade of C or higher, OR Completion of MATH 0095 with a grade of C or higher , OR NextGen score of 250-300 QAS, OR ACT score of 19+, OR MCA score of 1148+, OR an Accuplacer test score of 56 or above in Arithmetic AND a score of 76 or above in Elementary Algebra.

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Outcomes

1. Describe introductory Statistics

Learning Objectives

Recognize the basic vocabulary of statistics
Distinguish between population and sample
Categorize types of data- discrete or continuous; qualitative or quantitative
Distinguish between observational studies and experimental studies
Identify the basic techniques for choosing a sample
Investigate the ethical and practical concerns of conducting a study
Discuss and identify vocabulary related to bias or errors in a study

2. Illustrate Graphical Descriptions of Data

Learning Objectives

Construct a frequency distribution and describe the characteristics of a frequency distribution
Construct and interpret dot plots, histograms, stem and leaf plots, pie charts, bar graphs, and histograms
Identify misleading characteristics of various charts and graphs

3. Utilize Numerical Descriptions of Data

Learning Objectives

Compute the mean, median, mode, range, variance, and standard deviation
Determine the most appropriate measure of center
Describe and interpret standard deviation and variance
Use the empirical rule to describe data spread
Identify the various measures of position such as percentiles, and quartiles
Determine the outliers in a given set of data
Determine the z-score as a measure of relative position

4. Discuss Probability, Randomness, and Uncertainty

Learning Objectives

Describe the meaning of probability and experiments
Identify the basic types of probabilities
Determine whether events are independent or dependent
Determine probabilities using the addition rule
Determine the probability of a set and its complement and solve application problems
Combine probability and counting techniques to solve real-world applications
Differentiate between permutation and combination and solve application problems
Calculate conditional probabilities and solve application problems

5. Analyze Discrete Probability Distributions

Learning Objectives

Define a discrete random variable and calculate the expected value
Calculate the variance and standard deviation of a discrete probability distribution
Create the discrete probability distribution
Determine the expected win or loss of a game
Calculate probabilities using the binomial and the Poisson distribution

6. Describe Normal Probability Distributions

Learning Objectives

Identify the properties of a normal distribution
Use and interpret the normal distribution
Calculate the z-score of a point on a normal curve
Determine the area of a region under the normal curve using tables
Determine the value of a random variable given a z-score
Determine the probability using a normal distribution
Determine the value of a normally distributed random variable that represents a given percentile
Determine the z-value given a probability
Calculate probabilities by using the normal distribution as an approximation
Determine whether a normal distribution can be used to approximate a binomial distribution

7. Demonstrate The Central Limit Theorem

Learning Objectives

Determine the mean and standard deviation of a sampling distribution of sample means
Accept whether a normal distribution is appropriate to approximate a sampling distribution of sample means
Recognize the key concepts of the sampling distribution of the sample mean
Calculate normal probabilities for an individual value and a mean
Determine z-value using the Central Limit Theorem for population means
Calculate the sample proportion and the standard score of the sample proportion

8. Analyze Confidence Intervals

Learning Objectives

Compute the margin of error given a confidence interval
Compute the sample mean given a confidence interval
Construct a confidence interval for a population mean
Determine the appropriate method for calculating margin of error
Determine the best point estimate for a population mean
Determine the minimum sample size for a particular confidence level
Determine the area of a region under the normal curve using tables

9. Produce Confidence Intervals for Two Samples

Learning Objectives

Calculate the margin of error when comparing two population means
Construct and interpret a confidence interval for two means when sigma is known
Determine the best point estimate when comparing two population means
Construct and interpret a confidence interval for two means when the variances are equal and not equal
Construct and interpret a confidence interval for two means when the samples are dependent
Construct and interpret a confidence interval for two population proportions and variances
Determine the best point estimate when comparing two population variances

10. Accept and Interpret Hypothesis Testing

Learning Objectives

Accept the hypotheses for testing a population mean and proportion
Construct a rejection region for a mean using a z-critical value
Determine the p-value and the test statistic when testing a mean
Determine the type of hypothesis test
Interpret the conclusion to a hypothesis test for a mean
Perform a hypothesis test for a mean using the P-value method when sigma is known
Construct a rejection region for a mean when sigma is unknown
Perform a hypothesis test for a mean when sigma is unknown
Construct a rejection region for a population proportion
Determine the p-value and the test statistic when testing a proportion
Interpret the conclusion to a hypothesis test for a proportion
Perform a hypothesis test for a population proportion
Perform a hypothesis test for a population standard deviation and a population variance
Perform a chi-square test for goodness of fit

11. Perform Hypothesis Testing (Two or More Populations)

Learning Objectives

Perform a hypothesis test for two means when sigma is known, the variances are equal and not equal
Perform a hypothesis test for two means from dependent samples
Perform hypothesis tests comparing two population proportions
Perform a hypothesis test comparing two population variances
Accept the hypotheses for comparing two variances

12. Compute Regression, Inference, and Model Building

Learning Objectives

Calculate the correlation coefficient and the coefficient of determination
Create a scatter plot and calculate the correlation coefficient
Determine if a relationship is significant

Calculate a linear regression line and use it for prediction
Use linear and multiple regression models

SCC Accessibility Statement

Disability Services provides accommodations and other supports to students with permanent and temporary disabilities that affect their SCC experience. Disabilities may include mental health (anxiety, depression, PTSD), ADHD, learning disabilities, chronic health conditions (migraine, fibromyalgia), sensory disabilities, and temporary disabilities (broken arm, surgery). Common accommodations are extended test time, private room for testing, audiobooks, and sign language interpreter.

Contact us: Faribault A116 (507) 332-5847. North Mankato E112 (507) 389-7222. ds@southcentral.edu
www.southcentral.edu/disability