

Math 2830 – Introduction to Statistics Objectives

Descriptive Statistics

Collect, Organize and Display Data

Students should be able to:

- Understand the difference between qualitative and quantitative data.
 - Discrete vs. Continuous quantitative data.
- Understand/Identify the following sampling techniques.
 - Simple random sampling
 - Systematic sampling
 - Stratified sampling
 - Cluster sampling
 - Convenience sampling
- Understand/Explain the difference between observational and experimental studies.
- Identify observational and experimental studies.
- Design/Understand simple experiments and observational studies using:
 - Control Groups
 - Treatment Groups/Cases
 - Blinding
 - Randomization
 - Matched Pairs
- Understand the difference between a sample and a parameter.
- Compute and interpret the following descriptive statistics:
 - Mean, median, and mode
 - Range, interquartile range, variance, and standard deviation
 - Five Number Summary
- Determine and interpret measures of position:
 - Quartiles
 - Standard Scores
- Create and interpret the following data displays:
 - Frequency distributions, bar graphs, stem and leaf plots, and histograms
 - Box-and-Whisker Plot, time series graph, pie graph, and scatter plot
- Describe the shape/distribution of a data set (symmetric or skewed).
- Compute the correlation coefficient.
- Compute the equation of the regression line.
- Make predictions based on the regression line.

Probability

Students should be able to:

- Determine sample spaces.
- Calculate empirical probabilities
- Calculate theoretical probabilities of simple events
- Calculate theoretical probabilities of compound events
 - Using the addition rules
 - Using the multiplication rules
- Understand the difference between independent and dependent events.
- Calculate the conditional probabilities of an event.
- Construct and understand what constitutes a probability distribution.
- Determine the mean, standard deviation, and expected value for a discrete random variable.
- Understand and calculate probabilities of a binomial distribution.
- Calculate mean and standard deviation for the variable of a binomial distribution.
- Identify the properties of a normal distribution.
- Find probabilities for a normally distributed variable by transforming it into a standard normal variable.
- Find specific data values for given percentages/percentiles, using the standard normal distribution.
- Understand and use the central limit theorem to solve problems involving sample means for large samples.

Inferential Statistics

Students should be able to:

- Understand and interpret confidence intervals.
- Find the confidence interval for
 - A mean.
 - A proportion.
 - Difference between two means.
 - Difference between two proportions.
- Understand the hypothesis testing process.
- Type I and Type II error
- State the null and alternative hypotheses.
- Find the critical values and p-values.
- Interpret p-values.
- Interpret results from a hypothesis test in the context of the problem.
- Conduct a hypothesis test for
 - one-sample means.
 - one-sample proportions.
 - two-sample independent means.
 - two-sample dependent means.
 - two-sample proportions.

Project: Students must conduct a statistical study where they collect, organize, and analyze their own data using the hypothesis testing process.

Technology

- An emphasis should be on the use of the TI-83 and TI-84 for data analysis:

Hypothesis Tests – illustration of how to do all hypothesis test on calculator is fine but students tend to understand the hypothesis testing process better if the calculator isn't introduced until after they have learned the process for one sample tests.

- An emphasis on using Excel for graphical summaries.

Optional Material:

- Interpret the Correlation Coefficient r
- Hypothesis testing on the Correlation Coefficient

Optional Technology:

- R
- Minitab
- SPSS