

# MATH-1490: BUSINESS PROBABILITY AND STATISTICS I

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## Cuyahoga Community College

**Viewing: MATH-1490 : Business Probability and Statistics I**

**Board of Trustees:**

March 2020

**Academic Term:**

Fall 2022

**Subject Code**

MATH - Mathematics

**Course Number:**

1490

**Title:**

Business Probability and Statistics I

**Catalog Description:**

First of a two-semester introductory sequence in business probability and statistics. Intended for students majoring in business. Application of statistical methods to business and economic problems. Topics include study of descriptive statistics, elementary probability, random variables and probability distributions, binomial distribution, normal distribution, sampling concepts, sampling distribution of sample mean, interval estimation for population means and proportions, hypothesis testing, correlation and simple linear regression models.

**Credit Hour(s):**

3

**Lecture Hour(s):**

3

## Requisites

**Prerequisite and Corequisite**

MATH-1470 Modern Mathematics for Business and Social Science I, or MATH-1530 College Algebra, or MATH-153H College Algebra, or MATH-1580 Precalculus, or qualified Math Placement; or departmental approval: equivalent coursework.

## Outcomes

**Course Outcome(s):**

Give an overview of various types of sampling and the importance of randomization.

**Objective(s):**

1. Define and distinguish between population vs. sample and discuss how to select a simple random sample.
2. Identify different data types and distinguish between observational versus experimental studies.
3. Explain the basic principles of sampling methods.

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**Course Outcome(s):**

Organize and summarize data by using descriptive statistics and appropriate statistical graphics.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Create and interpret graphical methods to display a distribution of a variable and show relationships between two variables.
2. Compute, interpret and apply to business applications the measures of central tendency and spread (variation), e.g., mean, median, mode, range, variance, standard deviation, percentiles and quartiles.

3. Describe and explain the shape of a distribution and discuss characteristics that can effect its shape.
4. Explain and apply the Empirical Rule for symmetric data and business applications.

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**Course Outcome(s):**

Explain the concept of probability and how it relates to business applications.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Explain the concept of probability and its properties.
2. Perform computations using the rules of probability; addition and multiplication rules.
3. Define, formulate and apply conditional probability to the association between two categorical variables in two-way cross-tabulation tables.
4. Discuss statistical independence, use it to compute probabilities and apply it to business applications.

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**Course Outcome(s):**

Discuss discrete and continuous random variables and use their distributions to compute probabilities.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Explain discrete random variables and use their distributions to compute probabilities.
2. Define, compute, and interpret the expected value, variance, and standard deviation of a discrete random variable.
3. Discuss the binomial distribution and apply it to business applications.
4. Define and explain a continuous random variable and density curve.
5. Compute and evaluate probabilities and percentiles for normal densities.
6. Define and examine the normal and standard normal probability distribution, along with its properties and apply it to business applications.

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**Course Outcome(s):**

Explain the concept of sampling distributions and how it relates to business.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Discuss sampling distributions (sample means and proportions) using simulation , interactive applets, or other hands-on activities.
2. Compute and interpret the mean and standard error of the sample mean and sample proportion.
3. Explain the Central Limit Theorem and use it to compute probabilities and understand the shape of a distribution.

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**Course Outcome(s):**

Discuss how to estimate population parameters using point and interval estimates.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Define, compute, and interpret point estimates of a population mean and proportion.
2. Discuss of the concept of a confidence interval for a population mean and proportion including its margin of error and level of confidence.
3. Compute and interpret a confidence interval for a population mean and proportion.

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**Course Outcome(s):**

Use hypothesis testing as a tool for statistical decision making in a business context.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. List and explain the concept and steps of performing a hypothesis test for a single population mean and proportion.
  2. Use one or more pieces of statistical evidence such as p-value, critical value, and/or confidence interval to draw conclusions regarding hypotheses.
  3. Apply the steps of a hypothesis test to solve business applications and make recommendations.
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**Course Outcome(s):**

Use simple linear regression for business analysis and decision-making.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Define, construct and interpret a scatter plot to assess the appropriateness of performing a simple linear regression.
  2. Find and interpret the correlation coefficient and explain the distinction between correlation and causation.
  3. Find and interpret the least squares estimates of the intercept and slope.
  4. Explain how to use the least squares line to make predictions.
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**Course Outcome(s):**

Use a variety of technology, software packages and supplemental websites to solve economic and business problems.

**Objective(s):**

1. Use graphing Calculators, Excel, SPSS, Minitab and/or Statcrunch to perform statistical analysis, construct charts and graphs to solve probability and statistics problems.
  2. Use Supplemental Websites to solve a variety of probability and statistical problems.
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**Methods of Evaluation:**

1. Periodic exams.
2. Quizzes.
3. Homework.
4. In class collaborative work.
5. Projects employing technology and statistical software.
6. Comprehensive final exam.

**Course Content Outline:**

1. Graphs, Charts and Tables
  - a. Frequency and joint frequency distributions
  - b. Histograms and relative frequency histograms
  - c. Handling grouped data
  - d. Bar charts
  - e. Pie charts
  - f. Stem and Leaf Diagrams
  - g. Line charts
2. Data and Descriptive statistics
  - a. Data types
  - b. Measures of center and location

- c. Measure of variation
- d. Standardized data
- 3. Elementary probability
  - a. Tree diagram and counting techniques
  - b. Sample space and events
  - c. Rules of probability
  - d. Conditional probability
  - e. Multiplicative property of a sequence of events
- 4. Probability distributions
  - a. Random variable and its distribution
  - b. Expected value of a random variable
  - c. Mean and standard deviation of a probability distribution
  - d. Binomial distribution and its applications
  - e. Normal distribution and its applications
- 5. Statistical inferences on population means and proportions
  - a. Sampling techniques
  - b. Sampling error
  - c. Sampling distribution and sampling concepts
  - d. The central limit theorem
  - e. Point and interval estimation on the mean and proportion
  - f. Hypothesis testing for a single population mean and proportion
  - g. The t distribution and its application
- 6. Correlation and Simple Linear Regression Analysis
  - a. Scatter plots
  - b. Correlation coefficient
  - c. Least squares regression line
  - d. The simple linear regression model
  - e. Inferences on correlation and regression coefficients
  - f. Correlation versus causation
- 7. Use of technology, software packages and websites
  - a. Use graphing calculators and software packages for analysis
  - b. How to interpret and apply results to business applications
  - c. Use of supplemental websites.

## Resources

James T. McClave, George P. Benson and Terry Sincich. *Statistics for Business & Economics*. 13th ed. Pearson, 2018.

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Groebner, David, Patrick Shannon and Phillip Fry. *Statistics for Business & Economics*. 10th ed. Pearson, 2018.

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Anderson, David R. , Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, and James J. Cochran. *Statistics for Business and Economics*. 13th ed. Boston, MA: Cengage, 2018.

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Doane, David P. and Lori E. Seward. *Applied Statistics in Business and Economics*. 6th ed. McGraw Hill, 2019.

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## Instructional Services

### OAN Number:

Ohio Transfer 36 TMMSL and Transfer Assurance Guide OBU013

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