

MATH-1410: ELEMENTARY PROBABILITY AND STATISTICS I

Cuyahoga Community College

Viewing: MATH-1410 : Elementary Probability and Statistics I

Board of Trustees:

January 2024

Academic Term:

Fall 2024

Subject Code

MATH - Mathematics

Course Number:

1410

Title:

Elementary Probability and Statistics I

Catalog Description:

First of two-semester introductory sequence in probability and statistics. Intended for students majoring in liberal arts, business, sciences, engineering, and education. Includes study of descriptive statistics, elementary probability, probability distributions, normal distribution, binomial distribution, sampling concepts, sampling distribution of sample mean, estimation, and hypothesis testing.

Credit Hour(s):

3

Lecture Hour(s):

3

Lab Hour(s):

0

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

MATH-0965 Intermediate Algebra; or concurrent enrollment in MATH-0970 Essential Skills for Probability and Statistics; or qualified Math placement, or departmental approval: equivalent coursework. Note: Math 1240 taken prior to Fall 2024 , MATH-1200, 1250, or 1280 completed prior to Fall 2016 or MATH-1270 completed prior to Summer 2017 will also meet prerequisite requirements for this course.

Outcomes

Course Outcome(s):

Identify the characteristics of a well-designed statistical study and be able to critically evaluate aspects of a study.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Distinguish between an observational study and an experimental study and discuss the advantages and disadvantages of each.
2. Identify variables, the population of interest, and the sampling technique.
3. Compare the various sampling techniques and the advantages and disadvantages of each.
4. Identify possible sources of bias and confounding variables.
5. Give several reasons why the results of a study would be challenged.
6. Interpret correlation vs. causation.

Course Outcome(s):

Use graphs and numerical summaries to interpret data.

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. Calculate and interpret measures of center, relative position, dispersion, and shape.
2. Create and interpret bar graphs, pie graphs, histograms, frequency polygons, and box plots.

Course Outcome(s):

Create and use simple linear regression to describe bivariate data.

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. Construct scatter plots to represent variable relationships.
2. Calculate correlation and regression coefficients to determine their strength.
3. Use simple linear regression to find the line of best fit.
4. Recognize and interpret the difference between correlation and causation.

Course Outcome(s):

Compute the probability of single and multiple trial events.

Objective(s):

1. Compute the probability of compound events, independent events, and disjoint events.
2. Compute conditional probability.

Course Outcome(s):

Apply concepts of discrete random variables and their distributions for decision-making.

Objective(s):

1. Understand discrete random variables and find their distributions.
2. Calculate expected values.
3. Use a binomial random variable to determine probabilities.

Course Outcome(s):

Apply concepts of continuous random variables and their distributions for decision-making.

Objective(s):

1. Identify the properties of the normal random variable.
2. Calculate areas under the normal curve.
3. Find probabilities using z-scores.

Course Outcome(s):

Compute point estimates and interval estimates to make inferences about populations.

Objective(s):

1. Calculate point estimates of a single mean and single proportion.
2. Identify the properties of the Central Limit Theorem and its applications.
3. Compute and interpret interval estimates of a single mean and single proportion.
4. Determine required sample sizes to carry desired interval estimates.

Course Outcome(s):

Perform hypothesis tests to evaluate claims about a single population mean and single population proportion.

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. Determine the appropriate hypothesis test based upon a data set.
2. Identify and verify test assumptions.
3. Perform hypothesis tests using small and large samples.
4. Draw conclusions from the results of these tests.

Course Outcome(s):

Use a variety of technology, software packages and supplemental websites to solve probability and statistics problems.

Objective(s):

1. Use graphing calculators, Excel, and Minitab 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.

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. Foundational statistical terms
 - a. Sampling techniques
 - b. Population characteristics
 - c. Study attributes
 - d. Statistical misuses
2. Descriptive statistics
 - a. Frequency distribution
 - b. Measure of location
 - c. Measure of Center
 - d. Measure of variation
 - e. Graphical displays of data
3. Relation between two variables
 - a. Scatter plots
 - b. Linear correlation coefficient
 - c. Correlation versus causation

- d. Least squares regression line
- 4. Elementary probability
 - a. Sample space and events
 - b. Rules of probability
 - c. Conditional probability
 - d. Multiplicative property of a sequence of events
- 5. Probability distributions
 - a. Random variable and its distribution
 - b. Expected value of a random variable
 - c. Mean and variance of a probability distribution
 - d. Binomial distribution and its applications
 - e. Normal distribution and its applications
- 6. Statistical inferences on population means
 - a. Sampling techniques
 - b. Sampling distribution and sampling concepts
 - c. The central limit theorem
 - d. Point and interval estimation on the mean
 - e. Testing a hypothesis on the mean
 - f. The normal distribution and its applications
 - g. The t distribution and its application
- 7. Use of technology, software packages and websites
 - a. Use graphing calculators and software packages for analysis
 - b. How to interpret results
 - c. Use of supplemental websites

Resources

Sullivan, Michael. *Statistics: Informed Decisions Using Data*. 6th ed. Upper Saddle River, NJ: Prentice Hall, 2020.

Allen Bluman. *Elementary Statistics*. 11th ed. McGraw Hill, 2022.

Robert Gould and Colleen Ryan. *Introductory Statistics: Exploring the World Through Data*. 3rd ed. Pearson Education, Inc., 2019.

Carolyn Warren, Kimberly Denley, Emily Atchley. *Beginning Statistics*. 3rd ed. Hawkes Learning, 2021.

Barbara Illowsky and Susan Dean. *Introductory Statistics*. OpenStax, 2019.

Resources Other

American Statistical Association. *Guidelines for Assessment and Instruction in Statistics Education (GAISE) College Report 2016*. https://www.amstat.org/asa/files/pdfs/GAISE/GaiseCollege_Full.pdf

Instructional Services

OAN Number:

Ohio Transfer 36 TMM010

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