

MATH-0970: ESSENTIAL SKILLS FOR PROBABILITY AND STATISTICS

Cuyahoga Community College

Viewing: MATH-0970 : Essential Skills for Probability and Statistics

Board of Trustees:

January 2024

Academic Term:

Fall 2024

Subject Code

MATH - Mathematics

Course Number:

0970

Title:

Essential Skills for Probability and Statistics

Catalog Description:

This course covers various topics in developmental mathematics to support students enrolled in MATH 1410. Students apply remedial mathematics topics such as order of operations, radical expressions, fractions, decimals, percent, proportion, coordinates, slope, graphing of linear equations, basic dimensional analysis, mathematical phrasing and study skills just-in-time to strengthen comprehension of statistics concepts. This course requires co-enrollment with MATH-1410 Elementary Probability and Statistics I.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

MATH-0915 Basic Arithmetic and Pre-algebra or qualified math placement to enroll in MATH-0955 Beginning Algebra; and ENG-0995 Applied College Literacies, or appropriate score on English placement test to enroll in ENG-1010 College Composition I; and concurrent enrollment in MATH-1410 Elementary Probability and Statistics I.

Note: MATH-0910 Pre-Algebra and Basic Arithmetic Beginning Algebra I taken prior to Fall 2024 and ENG-0990 Language Fundamentals II taken prior to Fall 2021 will also meet prerequisite requirements.

Outcomes

Course Outcome(s):

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

Objective(s):

1. Define observational and experimental studies.
2. Apply library resources for finding statistical information.
3. Identify place values.
4. Round decimals.
5. Read a problem and determine the population of interest and sample.
6. Use dimensional analysis to differentiate between the English and metric measurement systems.
7. Use dimensional analysis to identify the base units of measurement in the English and metric measurement systems.
8. Practice naming variables and the population of interest.
9. Identify appropriate units of measure for various situations.
10. Explore different sampling techniques.
11. Summarize different types of bias and determine where they can be present.

12. Distinguish confounding scenarios.
13. Critique poor case studies.
14. Contrast poor case studies with ones that were better conducted.
15. Differentiate between correlation and causation, and how to describe, identify, and interpret them from statistical studies..
16. Demonstrate use of technology for entering data into a spreadsheet using Excel, Desmos, or another statistical computing program.

Course Outcome(s):

Use and practice the foundational and theoretical skills required for describing and interpreting data.

Objective(s):

1. Simplify expressions using the order of operations.
2. Compute sums and use appropriate summation symbols.
3. Compare and contrast measures of center, relative position and dispersion.
4. Contrast finding the median given an odd or even number of data points.
5. Differentiate between the formulas for center, relative position, and dispersion.
6. Associate inequality symbols with the mean and median for skew.
7. Given a percent, fraction, or decimal, write it in the other two formats.
8. Identify appropriate units of measure for various situations.
9. Use dimensional analysis to convert units of from one dimensional unit to another.
10. Apply dimensional analysis to recognize the first, second and third dimensional units of measure.
11. Determine the interrelationship of measurement systems and their properties to avoid incompatible units of measure.
12. Use technology such as Excel, Desmos, graphing calculator or statistical computing program for calculating center, spread, dispersion and graphs.
13. Interpret measures of center, relative position, dispersion and shape in context.
14. Learn and implement interpretations of graphs with appropriate terminology and technical writing.
15. Practice scaling the x and y axis on graphs.
16. Discuss best practices in graph presentation.
17. Explore the misuses of statistics including faulty presentations of data.

Course Outcome(s):

Use and practice the foundational and theoretical skills required for performing a simple linear regression analysis.

Objective(s):

1. Summarize the rectangular coordinate system and plot ordered pairs.
2. Read and interpret ordered pairs and linear graphs.
3. Use dimensional analysis to convert units of from one dimensional unit to another.
4. Apply dimensional analysis to identify appropriate units of measure for various situations.
5. Practice graphing linear equations.
6. Explain the elements of a linear equation such as the slope/rate of change, y-intercept, and slope-intercept form of a line.
7. Analyze linear regression output from statistical computing technology and interpret the elements of a linear equation in slope-intercept form in context.
8. Compare decimal place values and determine which one is larger using positive and negative numbers.
9. Relate the scatterplot and the calculated correlation coefficient and interpret in context.
10. Summarize evaluating linear equations.
11. Use the line of best fit to make predictions for the data.
12. Discuss examples of applications involving linear models.
13. Explain the dangers of extrapolation and misuses of linear models.
14. Discuss statistical studies that concluded causation inappropriately.

Course Outcome(s):

Use and practice the foundational and theoretical skills required for computing probabilities and applying probability distributions.

Objective(s):

1. Explain sets and relate them with sample spaces.
2. Differentiate between mutually exclusive, dependent, and independent events.
3. Convert between fractions, decimals, and percentages.
4. Demonstrate formal probability notation.
5. Read a two-way contingency table to extract information.
6. Analyze probabilities in context.
7. Use factorials to compute the size of a sample space.
8. Perform arithmetic fraction operations such as simplifying, adding, subtracting, multiplying, and dividing.
9. Demonstrate notation for conditional probability and how the sample space is reduced.
10. Explore different discrete distributions and their applications.
11. Differentiate between the value of a random variable and its associated probability in a discrete distribution.
12. Summarize identifying variables and parent populations.
13. Accurately round numbers to appropriate place values.
14. Summarize signed numbers.
15. Identify the expected value of a probability distribution and interpret it in context of the variables.
16. Practice reading problems and extracting relevant information.
17. Discuss examples of binomial random variables.
18. Explain continuous random variables.
19. Demonstrate inequality notation as it relates to continuous random variables.
20. Use dimensional analysis to convert units of from one dimensional unit to another.
21. Apply dimensional analysis to identify appropriate units of measure for various situations.
22. Use technology such as Excel, Desmos, graphing calculator or statistical computing program for computing binomial and normal probability.
23. Practice visualizing the normal curve and its related probability.
24. Calculate and compare z scores.
25. Solve equations for a variable.

Course Outcome(s):

Use and practice the foundational and theoretical skills required for computing point and interval estimates to make inferences about populations, performing hypothesis tests to evaluate claims about a single mean and single proportion for a population.

Objective(s):

1. Identify the properties of the mean and standard deviation.
2. Summarize proportions and determine the percentage from a description.
3. Distinguish between the mean and proportion from the context of a problem.
4. Contrast the population and sample.
5. Recognize symbols for parameters and statistics.
6. Identify the difference between parameters and statistics in context.
7. Differentiate between a probability distribution and a sampling distribution.
8. Summarize the Central Limit Theorem and apply appropriately to a problem.
9. Discuss margin of error for confidence intervals.
10. Practice extracting important information from a problem.
11. Use dimensional analysis to convert units of from one dimensional unit to another.
12. Apply dimensional analysis to identify appropriate units of measure for various situations.
13. Summarize order of operations and evaluate square roots.
14. Discuss rounding rules and relation to determining sample sizes.
15. Identify which probability distribution is used depending on the type of confidence interval or hypothesis test.
16. Discuss the conditions required for testing a single mean or proportion.
17. Practice determining if conditions are met or if assumptions are to be made performing a hypothesis test.
18. Summarize language associated with inequality and equality symbols.
19. Analyze confidence interval and hypothesis testing output for a single mean or single proportion from statistical computing technology and interpret the elements of the output in context.
20. Practice using appropriate language in statistical conclusions.

Course Outcome(s):

Create and implement a study skills and motivational strategy plan.

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. Define study skills and motivational strategies (i.e. manage time, take notes, create a mind map, create a mnemonic device, break up time, ask questions, self test, create a reward system, etc.).
 2. Compare study skills and motivational strategies and create a study skills and motivational strategy plan to use throughout the course.
 3. Examine techniques to deal with test anxiety.
 4. Assess techniques to make study sessions more effective and efficient.
 5. Review how to study for a comprehensive final exam.
 6. Relate the problem type with the required formula using a formula sheet.
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Methods of Evaluation:

1. Worksheets
2. Class Participation
3. Observation
4. Homework
5. Quizzes
6. Projects
7. Self-evaluations/Essay
8. In-class collaborative work

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 4
 - 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

McKeague, Charles P. (2023) *Corequisite for Statistics*, XYZ Textbooks.

Pellissippi State Community College. *A Co-Requisite Workbook for Statistics*. 2nd. Kendall Hunt, 2020.

Davis, D., Armtsrong, B., McCraith, M. *Prestatistics*. Boston:Cengage, 2019.

Illowsky, B., Dean, S. . (2022) (Sep 19, 2013) *Statistics*, OpenStax.

Desmos. *User Guide*. Desmos, 2019. http://s3.amazonaws.com/desmos/Desmos_User_Guide.pdf

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