Virginia Western Community College
MTH 155
Statistical Reasoning

Prerequisites
Competency in MTE 1-5 as demonstrated through placement or unit completion or equivalent OR Corequisite MCR 5: Learning Support for Statistical Reasoning.

Course Description
Presents elementary statistical methods and concepts including visual data presentation, descriptive statistics, probability, estimation, hypothesis testing, correlation and linear regression. Emphasis is placed on the development of statistical thinking, stimulation and the use of statistical software. (Credit will not be awarded for both MTH 155   Statistical Reasoning and MTH 245: Statistics I.)

Semester Credits: 3   Lecture Hours: 3

Required Materials

Textbook:
Introduction to Statistics: An active learning approach. Carlson & Winquist. 2nd edition. Sage. ISBN: 9781483378732.

Other Required Materials:
Textbook:
Introductory Statistics through Open Stax, which can be found **for free** at the following link:
https://cnx.org/contents/MBiUQmmY@18.54:kcV4GRqc@9/Preface

Course Outcomes

At the completion of this course, the student should be able to:
- Identify the difference between discrete and continuous quantitative data
- Construct and interpret graphical displays of data, including (but not limited to) box plots, line charts, histograms, and bar charts
- Construct and interpret frequency tables
- Compute measures of center (mean, median, mode), measures of variation, (range, interquartile range, standard deviation), and measures of position (percentiles, quartiles, standard scores)
- Recognize a representative sample and describe its importance
- Identify methods of sampling
- Explain the differences between observational studies and experiments
- Recognize and explain the key concepts in experiments, including the selection of treatment and control groups, the placebo effect, and blinding
- Describe the difference between relative frequency and theoretical probabilities and use each method to calculate probabilities of events
- Calculate probabilities of composite events using the complement rule, the addition rule, and the multiplication rule
- Use the normal distribution to calculate probabilities
- Identify when the use of the normal distribution is appropriate
- Recognize or restate the Central Limit Theorem and use it as appropriate
- Explain the difference between point and interval estimates
- Construct and interpret confidence intervals for population means and proportions
- Interpret the confidence level associated with an interval estimate
- Conduct hypothesis tests for population means and proportions
- Interpret the meaning of both rejecting and failing to reject the null hypothesis
- Describe Type I and Type II errors in the context of specific hypothesis tests
- Use a p-value to reach a conclusion in a hypothesis test
- Analyze scatterplots for patterns, linearity, and influential points
- Determine the equation of a least-squares regression line using statistical software and interpret its slope and intercept
- Calculate the correlation coefficient and the coefficient of determination using statistical software and interpret both.
- Conduct a chi-squared test for independence between rows and columns of a two-way contingency table

Topical Description

Course Sequencing

1. Open Stax Introductory Statistics Chapter 1
2. Carlson & Winquist Chapter 1
3. Carlson & Winquist Chapter 2
4. Carlson & Winquist Chapter 3
5. Carlson & Winquist Chapter 4
6. Open Stax Introductory Statistics Chapter 3
7. Open Stax Introductory Statistics Chapter 4: Sections 4.1-4.3
8. Carlson & Winquist Chapter 5
9. Carlson & Winquist Chapter 6
10. Carlson & Winquist Chapter 7
11. Carlson & Winquist Chapter 8
12. Open Stax Introductory Statistics Chapter 8: Section 8.3
13. Open Stax Introductory Statistics Chapter 9: Section 9.6
14. Open Stax Introductory Statistics Chapter 11: Section 11.1
15. Carlson & Winquist Chapter 14
16. Open Stax Introductory Statistics Chapter 12

Notes to Instructors

In order to cover all of the topics in the course, instructors must use material from both textbooks.

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