Wisconsin Indianhead Technical College

10804189 Introductory Statistics

Course Outcome Summary

Course Information

Description	Students taking Introductory Statistics display data with graphs, describe distributions with numbers perform correlation and regression analyses, and design experiments. They use probability and distributions to make predictions, estimate parameters, and test hypotheses. They draw inferences about relationships including ANOVA.
Instructional Level	Associate Degree
Total Credits	3.00
Total Hours	48.00

Types of Instruction

Instruction Type	Credits/Hours
Classroom Presentation (Lecture/Demonstration/Discussion)	3/48

Course History

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Last Approval Date	1/14/2014

Purpose/Goals

This course outcome summary includes competencies and performance standards for Introductory Statistics. This course is part of the General Studies Core offered throughout the Wisconsin Technical College System (WTCS). The course competencies are consistent among the colleges and are at baccalaureate level to accommodate student success in transfer to four-year colleges.

Pre/Corequisites

Prerequisite	Successful score on placement test or successful completion of 10834109 Pre-Algebra or any associate degree or college parallel level WTCS mathematics course

Course Competencies

1. Organize data

Domain *Cognitive* ***Level*** *Applying* ***Status*** *Active*

Assessment Strategies

1.1. by submitting tables, charts or graphs using software
1.2. by submitting tables, charts or graphs manually
1.3. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

1.1. you construct frequency distributions
1.2. you construct histograms
1.3. you construct stem and leaf diagrams
1.4. you construct pie charts
1.5. you construct box plots
1.6. you construct line graphs
1.7. you construct bar graphs
1.8. you apply standards of spelling, English grammar, and punctuation
1.9. the choice of statistical description is appropriate to the nature of the data
1.10. graphs have the professional attributes of the class examples
1.11. graphs accurately represent the data
1.12. numerical answers are accurate

Learning Objectives

1.a. Identify numerical measurements based on data sets as parameters or statistics
1.b. Identify the level of measurement characterized by a data set
1.c. Identify types of charts and graphs that are appropriate for a given data set
1.d. Construct a frequency distribution for a data set
1.e. Construct bar graphs, including histograms and Pareto charts
1.f. Construct a stem-and-leaf plot for a data set
1.g. Construct a pie chart for a data set
1.h. Construct a box plot (box and whisker diagram) for a data set
1.i. Construct a line graph, including time-series graphs, for a data set

2. Summarize data numerically

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

2.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

2.1. you determine measures of central tendency
2.2. you interpret measures of central tendency
2.3. you determine measures of spread
2.4. you interpret measures of spread
2.5. you determine measures of relative position (quartiles, percentiles)
2.6. you interpret measures of relative position
2.7. the choice of statistical description is appropriate to the nature of the data
2.8. numerical answers are accurate

Learning Objectives

2.a. Calculate measures of central tendency, including mean, median, mode, midrange, geometric mean, and weighted means from a data set
2.b. Calculate the mean from summarized data
2.c. Identify which measure(s) of center best fit a given data set
2.d. Calculate measures of dispersion, including range, standard deviation and variance, from a data set
2.e. Calculate the variance and standard deviation from summarized data
2.f. Apply the range rule of thumb to estimate standard deviation for a data set
2.g. Apply the empirical rule for data with an approximate bell-shaped distribution
2.h. Apply Chebyshev's Theorem to any data set

2.i. Calculate and interpret measures of position for a data set, including z-scores, percentiles, quartiles, deciles
2.j. Investigate data sets using statistical tools (such as graphs, measures of center, and measures of variation) to identify important characteristics of the data set

3. Use probability distributions

Domain *Cognitive* ***Level*** *Applying* ***Status*** *Active*

Assessment Strategies

3.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

3.1. you distinguish between theoretical and empirical probabilities
3.2. you create a probability distribution from observational data
3.3. you calculate theoretical probabilities of events
3.4. you evaluate the parameters of a probability distribution
3.5. you apply the Normal distribution to solve problems
3.6. you apply Central Limit Theorem
3.7. the choice of statistical description is appropriate to the nature of the data
3.8. numerical answers are accurate
3.9. you apply standards of spelling, English grammar, and punctuation in stating conclusions

Learning Objectives

3.a. Distinguish between theoretical (classical) and empirical (relative frequency) probabilities
3.b. Calculate probabilities: theoretical and empirical
3.c. Interpret the law of large numbers as it relates to empirical probabilities
3.d. Calculate probabilities of compound events, involving "or", "and", and "not"
3.e. Apply counting principles (fundamental counting rule, permutations, and combinations) to calculate theoretical probabilities
3.f. Identify the random variable in an experiment
3.g. Create a probability distribution from observational data
3.h. Evaluate the parameters (mean, variance, and standard deviation) of a probability distribution
3.i. Apply the binomial probability distribution to solve problems
3.j. Apply the normal distribution to solve problems
3.k. Apply the Central Limit Theorem to solve problems with and without the finite population correction factor
3.l. Apply the normal distribution to approximate the binomial distribution

4. Investigate study design

Domain *Cognitive* ***Level*** *Evaluating* ***Status*** *Active*

Assessment Strategies

4.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

4.1. you distinguish between experimental and observational studies
4.2. you locate sources of data
4.3. you identify sampling techniques
4.4. you critique the validity of the analysis
4.5. you identify sources of bias
4.6. numerical answers are accurate
4.7. you apply standards of spelling, English grammar, and punctuation in stating conclusions

Learning Objectives

4.a. Distinguish between observational studies and experiments as methods of obtaining data
4.b. Distinguish amongst the types of observational studies: cross-sectional, retrospective, and prospective
4.c. Identify the effects of possible confounding in an experiment
4.d. Identify the impact of controlling effects of variables through blinding, blocks, completely randomized experimental design and rigorously controlled design
4.e. Identify sources of bias in data

4.f. Identify sampling techniques

5. Draw inference about population parameters from sample data from one population

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

5.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

5.1. you chose appropriate procedure to construct a confidence interval for the population mean
5.2. you chose appropriate procedure to construct a confidence interval for the population standard deviation
5.3. you chose appropriate procedure to construct a confidence interval for the population proportion
5.4. you interpret confidence intervals
5.5. you analyze the role of sample size
5.6. you distinguish between random and non-random samples
5.7. you perform hypothesis test on a single population parameter
5.8. the choice of procedure is appropriate to the nature of the data (z distribution, t distribution)
5.9. numerical answers are accurate
5.10. you apply standards of spelling, English grammar, and punctuation in stating conclusions

Learning Objectives

5.a. Identify the sampling distribution of a statistic along with the corresponding mean and standard error of the mean
5.b. Determine sample size required to estimate a population parameter
5.c. Construct a confidence interval for the population proportion
5.d. Construct a confidence interval for the population mean
5.e. Construct a confidence interval for the population standard deviation
5.f. Interpret a confidence interval for any given population parameter (mean, standard deviation, proportion)
5.g. Identify the steps in a traditional hypothesis test
5.h. Identify the steps in a hypothesis test using P-values
5.i. Perform a hypothesis test on a population mean using the traditional method and the P-value method
5.j. Perform a hypothesis test on a population proportion using the traditional method and the P-value method
5.k. Perform a hypothesis test on a population variance using the traditional method and the P-value method

6. Draw inference about population parameters from sample data from two or more populations

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

6.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

6.1. you chose appropriate procedure to construct a confidence interval for the difference of population means
6.2. you chose appropriate procedure to construct a confidence interval for the difference of population proportions
6.3. you distinguish between independent random samples and matched pairs
6.4. you interpret confidence intervals
6.5. you analyze the role of sample size
6.6. you perform hypothesis test on a parameter from two populations
6.7. you perform hypothesis test on a parameter from more than two populations (F distribution, ANOVA)
6.8. you perform a chi square test on a contingency table for categorical variables
6.9. you perform a chi square test for "goodness of fit"
6.10. the choice of procedure is appropriate to the nature of the data
6.11. numerical answers are accurate
6.12. you apply standards of spelling, English grammar, and punctuation in stating conclusions

Learning Objectives

6.a. Distinguish between independent random samples and matched pairs samples

6.b. Select an appropriate procedure for comparing population parameters from two populations
6.c. Test inferences for the difference between two population proportions using confidence intervals and hypothesis tests
6.d. Test inferences for the difference between two population means from independent samples using confidence intervals and hypothesis tests
6.e. Test inferences for the difference between two population means for matched pairs using confidence intervals and hypothesis tests
6.f. Identify multinomial distributions
6.g. Complete a goodness-of-fit test to determine that an observed frequency distribution conforms to a claimed distribution
6.h. Complete a test of independence for a contingency table of data drawn from a single population
6.i. Complete a test of homogeneity on a contingency table of data drawn from different populations
6.j. Identify the characteristics of the F-distribution
6.k. Complete an analysis of variance comparing three or more population means for equality when sample sizes from each population are equal
6.l. Complete an analysis of variance comparing three or more population means for equality when sample sizes from each population are unequal

7. Evaluate correlation and linear regression in bi-variate data

Domain *Cognitive* ***Level*** *Evaluating* ***Status*** *Active*

Assessment Strategies

7.1. by completing assignments/written tests/projects

Criteria

Performance will be successful when:

7.1. you create a scatter plot of bi-variate data
7.2. you calculate the correlation coefficient
7.3. you interpret the correlation coefficient
7.4. you construct the best fit regression line
7.5. you use the best fit line to make predictions
7.6. you use the best fit line to solve applied problems
7.7. you interpret relationships between variables
7.8. numerical answers are accurate
7.9. you apply standards of spelling, English grammar, and punctuation in stating conclusions

Learning Objectives

7.a. Create a scatter plot of bi-variate data
7.b. Calculate the correlation coefficient
7.c. Complete a hypothesis test to determine whether there is a significant linear correlation between two variables
7.d. Construct the line of best fit (linear regression line)
7.e. Distinguish between total deviation, explained deviation, and unexplained deviation
7.f. Calculate the coefficient of determination as a measure of the amount of total variation that is explained
7.g. Use the line of best fit to make predictions
7.h. Construct a prediction interval to reflect the margin of error present in a prediction