WTCS Repository

10-804-135 Quantitative Reasoning

Course Outcome Summary

Course Information

Description This course is intended to develop analytic reasoning and the ability to solve quantitative problems. Topics to be covered may include: construction & interpretation of graphs; descriptive statistics; geometry & spatial visualizations; math of finance; functions and modeling; probability; and logic. Appropriate use of units and dimensions, estimates, mathematical notation, and available technology will be emphasized throughout the course.

Total Credits 3.00

Course Competencies

1. Analyze logical arguments

Assessment Strategies

1.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

1.1. you identify logical fallacies in popular arguments
1.2. you recognize arguments as inductive or deductive
1.3. you construct a short deductive proof
1.4. you identify inconsistencies in statistical arguments
1.5. you identify necessary assumptions and/or conditions for statistical techniques
1.6. you test conditions and/or reasonableness of assumptions

2. Employ counting principles

Assessment Strategies

2.1. in the solution on a quiz, homework, project or exam

Criteria

2.1. you apply permutations in determining the cardinality of ordered subsets
2.2. you apply combinations in determining the cardinality of unordered subsets
2.3. you determine the size of intersections, unions, and complements of sets
2.4. you apply rules of counting in solving applied contexts

3. Utilize probability models and rules

Assessment Strategies

3.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

3.1. you distinguish between theoretical and empirical probability
3.2. you compute probability using the basic definition
3.3. you compute the probability of joint and disjoint events
3.4. you compute conditional probabilities
3.5. you determine if two events are independent

4. Employ descriptive statistics

Assessment Strategies

4.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

4.1. you generate frequency distributions from a given data set
4.2. you calculate the mean, median, and mode of a distribution
4.3. you interpret the mean, median, and mode as measures of central tendency
4.4. you calculate quartile and percentile ranks as measures of position
4.5. you calculate range, standard deviation, and interquartile range as measures of spread for a distribution
4.6. you identify and interpret outliers
4.7. you use measures of central tendency and spread to compare and contrast two distributions
4.8. you construct a modified box-and-whisker plot to summarize comparisons
4.9. you use the language of probability to describe and evaluate statements involving risk

5. Apply inferential statistics

Assessment Strategies

5.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

5.1. you evaluate sampling strategies
5.2. you determine sources of bias
5.3. you describe the difference between correlation and causation
5.4. you distinguish between discrete and continuous probability distributions
5.5. you interpret probability as an area under the probability distribution
5.6. you identify confounding variables
5.7. you compute probabilities of events for discrete random variables
5.8. you compute probabilities of events for normally distributed random variables
5.9. you interpret normal distribution probabilities in solving applied contexts
5.10. you construct a confidence interval to estimate a population parameter
5.11. you interpret the error term for a confidence interval

6. Apply non-linear mathematical models

Assessment Strategies

6.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

6.1. you identify appropriate models for given data sets and applications
6.2. you develop piecewise, exponential, logarithmic, and logistic models to fit source data from real contextual applications
6.3. you identify reasonable domain and range for a non-linear or piecewise function model
6.4. you analyze model break-down conditions
6.5. you employ solution techniques to solve for an unknown value in the function model
6.6. you utilize solutions to interpret results in an applied context
6.7. you identify important characteristics of models (increasing/decreasing, cyclic, piecewise, etc.) that represent real world contexts
6.8. you understand that abstract mathematical models used to characterize real-world scenarios or physical relationships are not always exact and are subject to error
6.9. you create and use exponential models of real-world situations including growth and decay models
6.10. you compute interest amount and compound amount in compound interest financial models
6.11. you compute present and future values for compound interest applications
6.12. you compute the amount and payment of an annuity
6.13. you calculate the present and future value of an annuity

7. Develop graphical representations

Assessment Strategies

7.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

7.1. you plot points to construct the graph of a given equation
7.2. you evaluate graphs in an applied context
7.3. you construct pie charts, bar graphs, and line graphs
7.4. you construct appropriate charts or graphs to depict distributions
7.5. you utilize function tables
7.6. you employ calculators, spreadsheets, or other technological tools for construction of various graphs
7.7. you construct scatterplots of bivariate data

8. Apply principles of geometry

Assessment Strategies

8.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

8.1. you use appropriate units
8.2. you convert units as needed
8.3. you use precision and accuracy to round values appropriately
8.4. you apply circumference, perimeter and area of plane figures to physical applications
8.5. you apply volumes of three dimensional figures to physical applications

9. Apply linear mathematical models

Assessment Strategies

9.1. in the solution to a problem on a quiz, homework, project or exam

Criteria

9.1. you assign variables as needed
9.2. you develop linear equations which express inherent relationships in an applied context
9.3. you describe the behavior of linear models using words, algebraic symbols, graphs, and tables
9.4. you identify reasonable domain and range for a linear model
9.5. you use appropriate terms and units to describe rate of change
9.6. you compute the slope and intercept for a regression line
9.7. you interpret the slope and intercept for a regression line in an applied context
9.8. you analyze model break-down conditions
9.9. you employ solution techniques to solve for an unknown value in the functional model
9.10. you utilize solutions to interpret results in an applied context
9.11. you compute principal, rate, and time in simple interest financial models