

University of Arkansas – Fort Smith
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General Syllabus

MATH 1303 College Mathematics and Quantitative Literacy

Credit Hours: 3

Lecture Hours: 3

Laboratory Hour: 0

Prerequisite: MATH 0233 Beginning Algebra, or MATH 0304 Beginning and Intermediate Algebra (P, C or above), or required placement score.

Effective Catalog: 2020~2021

I. Course Information

A. Catalog Description

A strong emphasis will be placed on critical thinking, mathematical modeling, and technology. Topics include finance, statistics and probability, concepts of functions, and quantities and measures. A comprehensive mathematics course designed for general education core and for degrees not requiring College Algebra. (ACTS:MATH 1003)

A. Additional Information

This is the lowest level mathematics course acceptable for a bachelor's degree in Arkansas public colleges and universities. There will be four areas of study used to achieve these outcomes: personal, state and national finance; statistics and probability; mathematical modeling; and quantities and measurement. Content for the course will be based in the context of everyday life situations.

II. Student Learning Outcomes

A. Subject Matter

Upon completion of this course, the student will be able to:

1. Identify problem-solving strategies and apply them to contemporary everyday problems, both in work and in personal lives.
2. Analyze reports from media to determine completeness and accuracy, noting assumptions both stated and unstated.
3. Critique public consumer and political information for better understanding, completeness, and accuracy.
4. Interpret written materials containing quantitative information and communicate results in a written and oral format.
5. Utilize various online technologies/programs to solve problems.

6. Deal with situations involving quantitative components that they will encounter: as college students in other college-level classes; as citizens confronted with a wide array of public policy issues; as members of the work force; and as a parent.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning

Students will assign and use numbers, read and analyze data, draw inferences, and support conclusions based on sound mathematical reasoning. Students will apply appropriate mathematical/ statistical models to solve problems. Students will represent mathematical/statistical information symbolically, visually, numerically and verbally and will interpret models and data in order to draw inferences. Students will recognize the limitations of quantitative analysis.

Communication Skills (written and oral)

Students will communicate proficiently. Students will have to read and comprehend the written statements, and translate those statements into mathematical statements. Furthermore, after they have completed the problem, they will be expected to translate the mathematical statements back into written statements. Students will research various real-world situations, make calculations based upon that research and write papers (and at times, present to the class) about their research and conclusions.

Ethical Decision Making

Students will model ethical decision-making processes. Students will identify ethical dilemmas and affected parties in published statistical studies. Students will formulate resolutions to unethically proposed hypothetical statistical studies.

III. Major Course Topics

A. Personal, State and National Finance

1. Explore essentials of creating a family/personal budget.
2. Understand the difference between simple and compound interest and their effects on savings and expenditures.
3. Explore savings and investment accounts.
4. Explore loan payments, credit card accounts and mortgages.
5. Understand concepts and practices utilized in describing state and national revenues, expenditures, and deficits.

B. Statistics and Probability

1. Represent data graphically (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of data distributions to compare center (mean, median, and mode) and spread (interquartile range, standard deviation).
3. Interpret differences in shape, center and spread in the context of the data sets, accounting for possible extreme data points (outliers).

4. When appropriate, use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages.
5. Represent bivariate quantitative data on a scatter plot and describe how the variables are related.
6. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
7. Use technology to determine the line of best fit for data that appear to follow a linear pattern.
8. Compute (using technology) and interpret correlation of bivariate data.
9. Distinguish between correlation and causation and between conspiracy and coincidence.
10. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
11. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
12. Evaluate reports or print media articles based on statistical data.
13. Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other event.
14. Understand and determine probabilities of independent and dependent events.
15. Understand and determine conditional probabilities, applying in cases such as the false positive paradox.
16. Use permutations and combinations to compute probabilities of compound events and solve problems.
17. Find the expected payoff for a game of chance (e.g. Arkansas Scholarship Lottery instant win games).

C. Mathematical Modeling

1. Use function notation, understand functions as processes, and interpret statements that use function notation in terms of a context.
2. Construct graphs and tables that model changing quantities and interpret key features in terms of the quantities.
3. Interpret the slope and the intercept of a linear model in the context of the data.
4. Graph linear and exponential functions and identify critical points.
5. Compute (using technology) and interpret the correlation coefficient of a linear fit.
6. Distinguish between situations that can be modeled with linear functions and those modeled with exponential functions.
7. Use linear and exponential functions to model contextual situations such as costs (e.g. initial cost plus time dependent additions) and growth (reductions) of savings accounts (mortgage balances).

D. Quantities and Measurement

1. Understand large and small quantities through use of personal quantitative units, e.g. understanding the size of the national debt or the distance to the moon.
2. Understand the use of units, thinking of numbers as adjectives.
3. Study multiple ways of comparing quantities including the use of indices, e.g. the consumer price index and its relationship to the changing value of the dollar.

4. Investigate ways of finding exact and approximate areas and volumes of geometric and irregular shapes.