NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MDE 54 – LEARNING SUPPORT FOR QUANTITATIVE REASONING (3 CR.)

Course Description

Provides support to ensure success for students coenrolled in Quantitative Reasoning (MTH 154). Course will review foundational topics through direct instruction, guided practice, and individualized support. Lecture 3 hours. Total 3 hours per week.

General Course Purpose

This course provides support to ensure student success with the MTH 154 objectives.

Course Prerequisites/Corequisites

Corequisite: MTH 154

Course Objectives

- Communication
  - Interpret and communicate quantitative information and mathematical and statistical concepts using language appropriate to the context and intended audience.
    - Use appropriate mathematical language in oral, written and graphical forms.
    - Read and interpret real world advertisements, consumer information, government forms and news articles containing quantitative information.
    - Use quantitative information from multiple sources to make or critique an argument.
- Problem Solving
  - Share strategies to find solutions to life application problems to make sense of the mathematical content and persevere in solving them.
    - Apply strategies for solving open-ended questions requiring analysis and synthesis of multiple calculations, data summaries, and/or models.
    - Apply problem solving strategies to applications requiring multiple levels of engagement.
- Reasoning
  - Reason, model, and draw conclusions or make decisions with quantitative information.
    - Draw conclusions or make decisions in quantitatively based situations that are dependent upon multiple factors. Students will analyze how different situations would affect the decisions.
    - Present written or verbal justifications of decisions that include appropriate discussion of the mathematics involved.
    - Recognize when additional information is needed.
    - Recognize the appropriate ways to simplify a problem or its assumptions.
- Evaluation
  - Critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information.
    - Evaluate the validity and possible biases in arguments presented in real world contexts based on multiple sources of quantitative information - for example; advertising, internet postings, consumer information, political arguments.
- Technology
  - Use appropriate technology in a given context.

- Use a spreadsheet to organize quantitative information and make repeated calculations using simple formulas.
- Search for and apply internet-based tools appropriate for a given context - for example, an online tool to calculate credit card interest or a scheduling software package.
- Financial Literacy
  - Simple Interest
    - Define interest and its related terminology.
    - Develop simple interest formula.
    - Use simple interest formulas to analyze financial issues
  - Compound Interest
    - Compare and contrast compound interest and simple interest.
    - Explore the mechanics of the compound interest formula addressing items such as why the exponent and $(1 + {}^r/_n)$ is used by building the concept of compounding interest through manual computation of a savings or credit account.
    - Apply compound interest formulas to analyze financial issues
    - Create a table or graph to show the difference between compound interest and simple interest.
  - Borrowing
    - Compute payments and charges associated with loans.
    - Identify the true cost of a loan by computing APR
    - Evaluate the costs of buying items on credit
    - Compare total loan cost using varying lengths and interest rates.
  - Investing
    - Calculate the future value of an investment and analyze future value and present value of annuities (Take into consideration possible changes in rate, time, and money.)
    - Compare two stocks and justify your desire to buy, sell, or hold stock investment.
    - Explore different types of investment options and how choices may impact one's future such as in retirement.
- Perspective Matters - Number, Ratio, and Proportional Reasoning
  - Real-life problems that include interpretation and comparison of summaries which extend beyond simple measures, such as weighted averages, indices, or ranking and evaluate claims based on them.
  - Solve real-life problems requiring interpretation and comparison of various representations of ratios (i.e., fractions, decimals, rates, and percentages including part to part and part to whole, per capita data, growth and decay via absolute and relative change).
  - Distinguish between proportional and non-proportional situations and, when appropriate, apply proportional reasoning leading to symbolic representation of the relationship. Recognize when proportional techniques do not apply.
  - Solve real-life problems requiring conversion of units using dimensional analysis.
  - Apply scale factors to perform indirect measurements (e.g., maps, blueprints, concentrations, dosages, and densities).
  - Order real-life data written in scientific notation. The data should include different significant digits and different magnitudes.
- Modeling
  - Observation
    - Through an examination of examples, develop an ability to study physical systems in the real world by using abstract mathematical equations or computer programs
    - Collect measurements of physical systems and relate them to the input values for functions or programs.
    - Compare the predictions of a mathematical model with actual measurements obtained
    - Quantitatively compare linear and exponential growth

- Explore behind the scenes of familiar models encountered in daily life (such as weather models, simple physical models, population models, etc.)
    - o Mathematical Modeling and Analysis
        - Collect measurements and data gathered (possibly through surveys, internet, etc.) into tables, displays, charts, and simple graphs.
        - Create graphs and charts that are well-labeled and convey the appropriate information based upon chart type.
        - Explore interpolation and extrapolation of linear and non-linear data. Determine the appropriateness of interpolation and/or extrapolation.
        - Identify and distinguish linear and non-linear data sets arrayed in graphs. Identifying when a linear or non-linear model or trend is reasonable for given data or context.
        - Correctly associate a linear equation in two variables with its graph on a numerically accurate set of axes
        - Numerically distinguish which one of a set of linear equations is modeled by a given set of (x,y) data points
        - Identify a mathematical model's boundary values and limitations (and related values and regions where the model is undefined). Identify this as the domain of an algebraic model.
        - Using measurements (or other data) gathered, and a computer program (spreadsheet or GDC) to create different regressions (linear and non-linear), determine the best model, and use the model to estimate future values.
    - o Application
        - Starting with a verbally described requirement, generate an appropriate mathematical approach to creating a useful mathematical model for analysis
        - Explore the graphical solutions to systems of simultaneous linear equations, and their real-world applications
        - Numerically analyze and mathematically critique the utility of specific mathematical models: instructor-provided, classmate generated, and self-generated
- Validity Studies
    - o Identify logical fallacies in popular culture: political speeches, advertisements, and other attempts to persuade
    - o Analyze arguments or statements from all forms of media to identify misleading information, biases, and statements of fact.
    - o Develop and apply a variety of strategies for verifying numerical and statistical information found through web searches.
    - o Apply the use of basic symbolic logic, truth values, and set theories to justify decisions made in real-life applications, such as if-then-else statements in spreadsheets, Venn Diagrams to organize options, truth values as related to spreadsheet and flow-chart output. (Students must have experience with both symbolic logic and basic truth tables to meet this standard.)

Major Topics to be Included

- Arithmetic and order of operations
- Operations with fractions, percentages, and decimals
- Exponents
- Formulas
- Units and measurement
- Simplifying algebraic expressions and solving linear equations
- Using technology including calculators and spreadsheet software