ROWAN UNIVERSITY
Department of Mathematics

Master Syllabus

MATH 01090 Foundations of Mathematical Reasoning (3sh)

CATALOG DESCRIPTION:

Foundations of Mathematical Reasoning is a semester-long quantitative literacy-based course designed to provide students with the skills and conceptual understanding to succeed in a college-level statistics or quantitative literacy course. The 3 credits for this course do not count toward graduation requirements.

OBJECTIVES:

- Students will develop number sense and the ability to apply concepts of numeracy to investigate and describe quantitative relationships and solve real-world problems in a variety of contexts.

- Students will use proportional reasoning to solve problems that require ratios, rates, proportions, and scaling.
- Students will transition from specific and numeric reasoning to general and abstract reasoning using the language and structure of algebra to investigate, represent, and solve problems.
- Students will understand and critically evaluate statements that appear in the popular media (especially in presenting medical information) involving risk and arguments based on probability.
- Students will understand, interpret, and make decisions based on financial information commonly presented to consumers.
- Students will understand that quantitative information presented in the media and by other entities can sometimes be useful and sometimes be misleading.

PREREQUISITES:

Appropriate test scores.

CONTENT:

1. Numeracy
    - Demonstrate operation sense and communicate verbally and symbolically with real numbers.
    - Demonstrate an understanding of fractions, decimals, and percentages by representing quantities in equivalent forms, comparing the size of numbers in different forms and interpreting the meaning of numbers in different forms.
    - Solve problems involving calculations with percentages and interpret the results.
    - Demonstrate an understanding of large and small numbers by interpreting and communicating with different forms (including words, fractions, decimals, standard notation, and scientific notation) and compare magnitudes.

- Use estimation skills, and know why, how, and when to estimate results.
- Solve problems involving measurement including the correct use of units.
- Use dimensional analysis to convert between units of measurements and to solve problems involving multiple units of measurement.
- Read, interpret, and make decisions about data summarized numerically (e.g., measures of central tendency and spread), in tables, and in graphical displays (e.g., line graphs, bar graphs, scatterplots, and histograms).

2. Proportional Reasoning
    - Represent, and use ratios in a variety of forms (including percentages) and contexts.
    - Determine whether a proportional relationship exists based on how one value influences another.
    - Analyze, represent, and solve real-world problems involving proportional relationships, with attention to appropriate use of units.
3. Algebraic Competence, Reasoning, and Modeling
    - Demonstrate understanding of the meaning and uses of variables as unknowns, in equations, in simplifying expressions, and as quantities that vary, and use that understanding to represent quantitative situations symbolically.
    - Describe, identify, compare, and contrast the effect of multiplicative or additive change.
    - Analyze real-world problem situations, and use variables to construct and solve equations involving one or more unknown or variable quantities.
    - Express and interpret relationships using inequality symbols.
    - Construct and use mathematical models to solve problems from a variety of contexts and to make predictions/decisions.
    - Represent mathematical models in verbal, algebraic, graphical, and tabular form.
    - Recognize when a linear model is appropriate and, if appropriate, use a linear model to represent the relationship between two quantitative variables.
4. Probabilistic Reasoning to Assess Risk
    - Interpret statements about chance, risk, and probability that appear in everyday media (including terms like unlikely, rare, impossible).
    - Identify common pitfalls in reasoning about risk and probability.
    - Interpret in context marginal, joint, and conditional relative frequencies in context for data summarized in a two-way table and identify which relative frequency is appropriate to answer a contextual question.
    - Demonstrate understanding of absolute risk and relative risk (percentage change in risk) by describing how each provides different information about risk.
5. Quantitative Reasoning in Personal Finance
    - Demonstrate understanding of common types of consumer debt and explain how different factors affect the amount that the consumer pays.
    - Demonstrate understanding of compound interest and how it relates to saving money.
    - Identify erroneous or misleading information in advertising or consumer information.
6. Quantitative Reasoning in Civic Life
    - Use quantitative information to explore the impact of policies or behaviors on a population. This might include issues with social, economic, or environmental impacts.
    - Identify erroneous, misleading, or conflicting information presented by individuals or groups regarding social, economic, or environmental issues.

SUGGESTED TEXTS:

- Dana Center FMR materials distributed by Lumen Learning at: https://lumenlearning.com/courses/dana-center-foundations-of-mathematical-reasoning/

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