

Quantitative Reasoning Assessment Rubric

Definition

Courses in this competency prepare students to apply mathematical reasoning to formulate and solve problems in a variety of contexts and real-world situations. Students will learn to identify and understand the role that mathematics plays in the world in order to make well-founded judgments and decisions as engaged and reflective citizens.

Framing Language

A course approved in the Quantitative Reasoning competency prepares students to apply mathematical reasoning to formulate and solve problems from a variety of contexts and real-world situations. Quantitative Reasoning involves more than being proficient at computations and data manipulation. Necessary skills include the capacity for analyzing and interpreting numerical and spatial information to explain and predict phenomena in a variety of contexts. Individuals with Quantitative Reasoning skills can understand and create arguments supported by numerical evidence and can communicate those arguments. Ultimately, Quantitative Reasoning allows people to identify and understand the role that mathematics plays in the world in order to make well-founded judgments and decisions as engaged and reflective citizens.

Glossary

Mathematical Form – an element for communicating mathematical concepts and language such as functions, equations, graphs, diagrams, tables, words, geometric figures

Quantitative Argument – a sequence of statements based on quantitative evidence and mathematical forms, meant to demonstrate whether a claim is true or false

Quantitative Evidence – numerical or statistical data used to support claims in a quantitative argument

Rubric Key

Dimension – A dimension expresses a fundamental aspect of a given Student Learning Outcome.

Level – The levels of learning describe progressive achievement, moving from Developing (Level 1) to Sophisticated (Level 4). Basic Competence in this MAC competency is achieved at Level 2. Students should be given opportunities to develop further levels of achievement in their upper-level, program-specific courses, after their initial introductory-level exposure to its fundamentals in a MAC-designated course.

SLO – A Student Learning Outcome (SLO) expresses the core learning goals of a curriculum. This rubric presents the SLOs for this MAC competency. Any course designated to deliver this competency is expected to state these SLOs verbatim in the course syllabus and to foreground them in its design and delivery.

SLO #1: Students will interrelate real world information with mathematical forms (e.g., with functions, equations, graphs, diagrams, tables, words, geometric figures).				
Dimensions	Sophisticated competence (Level 4)	Emerging competence (Level 3)	MAC (Basic) competence (Level 2)	Developing competence (Level 1)
Representation of information in various mathematical forms	Constructs mathematical forms that describe the information and evaluates how accurate this representation is.	Explains how the information can be described by appropriate mathematical forms and applies this representation to analyze the information.	Demonstrates how the information can be described by mathematical forms and applies this representation to describe the information.	Recognizes mathematical forms that can relate to the information.
Interpretation of information presented in mathematical forms	Proposes an appropriate interpretation of the information presented in mathematical forms and assesses the accuracy of this representation.	Explains how mathematical forms represent the information and correctly interprets the mathematical conclusions.	Describes how mathematical forms represent the information and interprets the mathematical conclusions.	States, perhaps incompletely, how mathematical forms represent the information but draws incorrect conclusions from this representation.

SLO #2: Students will formulate and justify conclusions based on quantitative arguments.

Dimensions	Sophisticated competence (Level 4)	Emerging competence (Level 3)	MAC (Basic) competence (Level 2)	Developing competence (Level 1)
Formulation of quantitative arguments to solve problems	Devises quantitative arguments to solve problems completely and effectively.	Explains how quantitative arguments can be used to accurately solve problems.	Applies quantitative arguments to solve problems.	Outlines quantitative arguments to attempt to solve problems.
Analysis of quantitative arguments to determine whether stated conclusions can be inferred and justified	Evaluates quantitative arguments and draws appropriate conclusions.	Explains how conclusions can be justified by valid quantitative arguments.	Demonstrates how conclusions can be inferred from quantitative arguments.	Identifies possible conclusions from quantitative arguments.

SLO #3: Students will communicate the quantitative evidence of the argument.

Dimensions	Sophisticated competence (Level 4)	Emerging competence (Level 3)	MAC (Basic) competence (Level 2)	Developing competence (Level 1)
Communication of quantitative evidence in support of the argument or purpose of the work	Creates an effective argument based on strong quantitative evidence.	Justifies an argument based on explicit quantitative evidence.	Constructs an argument mostly based on quantitative evidence.	Outlines an argument partially based on quantitative evidence.

Identification of important assumptions that have been made in the solution process	Evaluates the appropriateness of the assumptions in quantitative arguments and assesses the validity of the conclusions.	Analyzes the validity of assumptions in quantitative arguments.	Describes explicitly the assumptions in quantitative arguments.	Recognizes some assumptions in quantitative arguments.
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Revised version. Approved by the General Education Council, April 2023.