Quantitative and Mathematical Reasoning

Definition

Students analyze, explore, and develop arguments through the use of mathematical and/or statistical reasoning; demonstrate an appreciation of the application of quantitative and mathematical reasoning to the broader world.

	Capstone 4	Milestones 3	2	Benchmark 1
Interpretation *Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.	Provides accurate explanations of information presented in mathematical forms.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation and Computation	Calculations and computations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations and computations are also presented elegantly (clearly, concisely, etc.)	Calculations and computations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations and computations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations and computations are attempted but are both unsuccessful and are not comprehensive.
Application / Analysis *Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis*	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for routine (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Communication *Expressing reasoning and quantitative evidence in support of the argument or purpose of the work.*	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few," "increasing," "small," and the like in place of actual quantities.)
Logical and Mathematical Reasoning	Student develops a complete and valid argument along with evidence and/or justification to support a proposition/conjecture or conclusion.	Student develops an adequately complete and valid argument along with evidence and/or justification to support a proposition/conjecture or conclusion.	Student commits minor errors in the development of an argument that supports a proposition/conjecture or conclusion.	Student attempts to develop an argument that supports a proposition or conclusion.
Assumptions (for relevant courses e.g., Statistics) *Ability to make and evaluate important assumptions in estimation, modeling, and data analysis*	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.