Quantitative and Logical Reasoning Rubric DRAFT

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| SLO:  Students will: | Does not meet General Education Proficiency | Beginning | Intermediate | Advanced | Beyond Advanced |
| Critique quantitative or logical assertions using mathematical, logical, statistical, and/or algorithmic reasoning.3 |  | Identifies a stated MLSA2 assertion and the methods used to analyze the validity of the assertion. Discusses the veracity of the assertion based on the methods. | Assesses the veracity of the assertion based on the methods including identifying strengths, weaknesses and/or limitations in the reasoning. | Thoroughly analyzes the validity of the methods/conclusions, including the limitations of the model. Extrapolates analysis to other related systems. |  |
| Use mathematical, logical, statistical, and/or algorithmic analysis to make decisions and/or solve problems, including thorough examination of assumptions and utilization of proper methods.4 |  | Selects the appropriate MLSA tools and uses them correctly to solve or analyze a problem. | Identifies assumptions or limitations of the methods used for the solution. | Integrates multiple MLSA tools to set up and solve problems. Carefully analyzes limitations of assumptions involved in finding solutions. |  |
| Articulate the substance and meaning of a critical mathematical, logical, statistical, and/or algorithmic analysis of a complex problem, including assumptions, methods, limitations, broader impacts, and conclusions.5 |  | Communicates basic understanding of the substance and meaning of a complex problem.  Develops and interprets the results of a MLSA analysis of the problem.  Identifies some of the limitations and broader impact. | Communicates moderate understanding of the substance and meaning of a complex problem. Discusses strengths and limitations of their analysis of the problem, as well as broader impacts. | Communicates a deep understanding of the substance and meaning of the problem. Addresses multiple limitations, broader impacts, potentially conflicting tradeoffs. Explores increasing levels of sophistication to modeling and/or analysis. |  |

**NOTES:**

1. We are working under the assumption that there may be QR courses offered that do NOT prepare students to reach the ‘Advanced’ level on this rubric. For example, MCS-115, Nature of Mathematics, may not aim to reach the ‘Advanced’ level of ‘Articulate the substance and meaning of a critical MLSA analysis.’
2. MLSA is our abbreviation for **m**athematical, **l**ogical, **s**tatistical, and/or **a**lgorithmic.
3. We view the first item as an ability to judge the MLSA quality of an existing source, for example a problem presented by the instructor or an externally published article in book, paper, etc). The analysis will involve applications of MLSA tools to which the student has been previously introduced. It is likely that this first SLO will be present multiple times during the course in homework assignments, group problems, etc.
4. We view the second item as the ability to use MLSA tools and apply them to problems (either theoretical or practical) common in the discipline. This may be demonstrated on typical examination problems.
5. We view the third item as the ability to construct and analyze a more complex problem; this may be a multifaceted problem that may not have a single simple solution or have ambiguous limitations. This includes the ability to communicate the analysis and judge the solution’s strengths and weaknesses. Broader impact may include ethical, societal, economic, scientific implications of the problem or its solution. This SLO may likely be addressed in the form of a larger project incorporated into the course.

Rubric Information:

* “Beginning” meets the benchmark for General Education. It may or may not meet the expectations of a particular course.
* Student work must meet all the criteria in a category in order to satisfy that category. If the student work is between “Beginning” and “Intermediate” (meeting all the “Beginning” criteria and achieving some, but not all, of the “Intermediate” criteria), the student work belongs in the “Beginning” category.
* This rubric does not give specific criteria for “Does not meet General Education Proficiency” and “Beyond Advanced.” If student work does not meet “Beginning,” the work “Does not meet General Education Proficiency.” If the student work meets all “Advanced” criteria and exceeds some or all of it, the student work is “Beyond Advanced.”