Queens College Academic Senate
Undergraduate Curriculum Committee
May 7, 2009

> The UCC asked the Ad-hoc Committee on Quantitative Reasoning Across the Curriculum to prepare an opinion paper for the General Education Quantitative Reasoning guidelines based on the Gen Ed Task Force Report and the approved PLAS proposal. The following document is the result of that request and is presented **as information** for **possible discussion** to the Senate. It is neither a report nor a motion from the UCC at this moment.

Quantitative and Abstract Reasoning Curriculum : Proposed Guidelines for QAR Courses

Numeracy and quantitative / abstract reasoning are increasingly important abilities in contemporary life, in many respects comparable in significance to literacy. The development of these abilities needs more focused and systematic attention in the undergraduate curriculum. Citizens in a democratic society are constantly bombarded by numerical data used to justify and explain public policy and government decisions. Numerical information is used and generated by most businesses, professions, and many fields of academic research. When such information is not present, often a strong case can be made that it should; quantitative / abstract reasoning is often missing or ill-used in instances where it is needed, to buttress arguments or justify actions. Knowing how and when to employ and interpret quantitative information, considering not only the data at hand but also the logic behind it, is vital in any circumstance when the intent is to persuade, inform, and educate.

The art of exact thinking encompasses logical inference, numerical as well as symbolic calculation, and quantitative modeling. This would also include the art of algorithmic problem solving—recognizing the need for and finding the steps of a goal-oriented computational process. However, not everything is a quantifiable certainty. We need the ability to view all available evidence with the proper perspective and make a judgment call or educated guess based on incomplete and/or uncertain information (e.g., to diagnose a patient with atypical symptoms, to forecast economic growth, to take sides in a controversy—be it scientific or political). Thus, quantitative reasoning draws on the capacity of its practitioners to explain and interpret data within the context of the material at hand, and across formats, using logic that appeals visually, orally, and in writing. Courses which contribute to the understanding of abstract or quantitative reasoning focus on such topics as the application of statistics to discovering the significance of data, formal systems of analysis, the structure of systems of formal logic and languages, and mathematics—both pure mathematics and mathematics as applied to areas such as technology, quantitative natural and social sciences and the humanities.

Students need to develop competency in interpreting mathematical data (both numerical and graphical), as well as the capacity to apply critical analytical skills to understand and analyze arguments that would either be enhanced with numerical support or that are themselves based upon quantitative relationships and logical assertions. This includes the ability to both understand the need for quantitative data, and when and how to use it wisely. Specific examples of what we expect students to be able to do include:

- Recognize and construct quantitative relationships from verbal statements of a problem and apply mathematical reasoning to real-world information, in order to accurately prove a point or solve a problem;
- Tabulate, analyze, represent graphically, and draw inferences from numerical data, in pursuit of meaning;
- Understand issues of scale and rates of change and their application, in service of establishing trends that are true—or not;
- Draw accurate conclusions based on statistics and probability, recognizing both the power and limitations of these methods.